FIRST AID TO THE INJURED

L. K. Bone

67, Hackfield Rd.,

Basingstoke

OTHER AUTHORISED TEXT BOOKS, &c., PUBLISHED BY THE ASSOCIATION.

"A Preliminary Course of First Aid." 6d. Post, 7d.

"First Aid in Coal Mines." 6d. Post, 7d.

"A Catechism of First Aid." 6d. Post, 7d.

"Problems in First Aid." 9d. Post, 10½d.

"Home Nursing." 1s. 6d. Post, 1s. 7½d.

"A Catechism of Home Nursing." 6d. Post, 7½d.

"Domestic and Personal Hygiene." 1s. 6d. Post, 1s. 7½d.

"A Catechism of Hygiene." 9d. Post, 10d.

"Notes on Military Sanitation." 9d. Post, 10d.

"To Restore the Apparently Drowned." Poster 3d. Post, 5½d.

Directions as to the Restoration of Persons suffering from Electric Shock. Poster, 3d. Post, 5½d.

"Manual of Drill and Camping for the St. John Ambulance Brigade." 1s. 6d. Post, 1s. 7½d.

"First Aid Principles." Card, ½d.; 4d. doz. Post, 6d.

"Specimen Examination Papers." 3d. Post, 4d.

Small Anatomical Diagram. 2d. Post, 3d.

The Grand Priory of the Order of the Hospital of St. John of Jerusalem in England. By Col. E. J. King, C.M.G., F.S.A. 7s. 6d. Post, 8s.

General Regulations, S.J.A.B. Post, 6d.

Rules for Corps and Divisions. 2d. Post, 3d.

S.J.A.B. Cash, Minute and Occurrence Books. Set. 10s. Post, 10s. 9d. **Receipt Book,** 6d. Post, 7½d,

Large Physiological Diagrams. Set of five, 33s. 6d. Post, 34s. 6d.

FIRST AID TO THE INJURED

THE AUTHORISED TEXTBOOK

OF THE

ST. JOHN AMBULANCE ASSOCIATION

BEING THE AMBULANCE DEPARTMENT OF

The Grand Priory in the British Realm

of the

Venerable Order of the Hospital of St. John of Jerusalem

ORIGINALLY COMPILED BY

The Late Colonel Sir JAMES CANTLIE,

K.B.E., M.A., M.B., F.R.C.S., V.D.,

and Revised by Committees in 1917 and 1928,

WITH APPENDICES.

THIRTY-EIGHTH EDITION. FIFTH ISSUE OF 50,000.

Price 1s. 6d. net.; by Post, 1s. 7½d.

LONDON:

THE ST. JOHN AMBULANCE ASSOCIATION,

ST. JOHN'S GATE, CLERKENWELL, E.C.1.

COPYRIGHT.

L.M.—F.RG

SYLLABUS OF INSTRUCTION—ADULT COURSE.

It is contrary to the Regulations to hold Mixed Classes of men and women.

FIRST LECTURE.

A. Outline and Principles of First Aid.

B. A brief description of the Structure and Functions of the Body

C. Fractures—Causes, varieties, signs and symptoms.

D. Treatment of Fractures—General Rules.

E. The Triangular Bandage—Its application to the Head, Chest, Back, Shoulder, Elbow, Hand, Hip, Knee and Foot. Arm Slings (Large, Small and St. John).

SECOND LECTURE.

A. Individual Fractures—Details of treatment:—The Skull, Lower Jaw, Spine Ribs, Breast-bone, Collar-bone, Shoulder-blade, Arm, Forearm, Hand, Pelvis, Thigh, Knee-cap, Leg and Foot.

B. Dislocations, Sprains, Strains—Signs, symptoms and treatment.

C. Practice—Treatment of Fractures.

THIRD LECTURE.

A. General description of the Heart and Blood Vessels.

B. The Circulation of the Blood.

C. Wounds and Hæmorrhage.

D. Wounds accompanied by Arterial Hæmorrhage.

E. The situation of the main arteries—Pressure points.

F. Wounds accompanied by Capillary or Venous Hæmorrhage—Varicose Veins.

G. Hæmorrhage from special regions—Bruises.

H. Practice—Compression of arteries.

Fourth Lecture.

A. Injuries to Internal Organs—Hæmorrhage.

B. Miscellaneous Injuries—Burns, Poisoned Wounds, Frost-bite, Foreign Bodies.

C. Practice—Treatment of Fractures and Hæmorrhage (as in Lectures II. and III.).

Fifth Lecture.

A. Respiration—Natural and Artificial.

B. Asphyxia.

C. The Nervous System.

D. Insensibility.

E. Practice—Artificial Respiration.

Sixth Lecture.

A. Poisons.

B. Transport of the injured.

(i.) For Males, Hand Seats and Stretcher Exercises.

(ii.) For Females, Hand Seats only.

D. Preparation for the reception of accident cases.

Note I.—The subject of poisons should be treated in a general manner; the common poisons classified, and only their general symptoms, effects and treatment taught.

Note II.—The latter part of each lecture should be devoted to practical work, such as the application of bandages and splints, lifting and carrying wounded on stretchers.

Note III.—When possible a skeleton should be used. Too much time should not, however, be spent on instruction in anatomical and physiological details. Lecturers and Examiners are particularly requested to remember that it is "First Aid" that has to be taught and tested, and not anatomy and physiology.

CONTENTS.

CHAPTER		PAGE
I.	Outline of First Aid	11
II.	Bandages	23
III.	Structure and Functions of the Body.	36
IV.	Fractures	53
V.	Injuries to Joints and Muscles	82
VI.	Circulation of the Blood	86
VII.	Wounds and Hæmorrhage	91
VIII.	Injuries to Internal Organs	121
IX.	Miscellaneous Injuries	127
X.	Respiratory System	139
XI.	Asphyxia	147
XII.	The Nervous System	152
XIII.	Insensibility	155
XIV.	Poisons	170
XV.	Transport of Injured Persons	179
XVI.	Preparation for Reception of Accidents	212

APPENDICES.

(*Not included in the Syllabus of the First Aid Course.*)

	The Roller Bandage	214
	Silvester's Method of Artificial Respiration	224
	The Thomas Splint	226
	First Aid and Ambulance in Factories and Workshops	234

LIST OF ILLUSTRATIONS.

	Page
Skeleton showing position of main arteries	*frontispiece*
The Ambulance Cross	17
Triangular bandage spread out and folded ..	24
Reef knot	25
Granny knot	25
Large arm sling	26
Small arm sling	26
St. John sling	28
Triangular bandage for the head	29
Triangular bandage for the shoulder	30
Triangular bandage for the hip	31
Triangular bandage for the hand	32
Triangular bandage for the foot	32
Triangular bandage for the chest	33
Triangular bandage for the knee	34
Triangular bandage for the elbow	34
Skull and vertebral column	39
Vertebra	39
Bones of the left upper limb..	42
Bones of the left lower limb	44
Shoulder joint	46
Ankle	46
Organs of the chest and abdomen	49
Loop knot	59
Bandage for fracture of lower jaw	61
Bandages for simple fracture of ribs	65
Bandages for fracture of collar-bone	67
Bandage for fracture of shoulder-blade	68
Treatment of fracture of arm	69
Angular splint	70

	page
Treatment of fracture of forearm	71
Treatment of crushed hand	71
Treatment of fracture of thigh-bone	74
Fracture of knee-cap	74
Treatment of fracture of knee-cap	75
Treatment of fracture of leg	77
Treatment of crushed foot	78
Diagram of the heart, lungs, and air passages ..	87
Diagram of the circulation of the blood	89
St. John tourniquet	97
Digital pressure on carotid artery	100
Digital pressure on facial artery	101
Digital pressure on temporal artery	101
Digital pressure on occipital artery	102
Pad and bandage to arrest hæmorrhage from temple	102
Ring pad	103
Digital pressure on subclavian artery	104
Pad and bandages to apply pressure on axillary artery	105
Digital pressure on brachial artery	106
Digital pressure on radial and ulnar arteries ..	107
Pad and bandage to arrest hæmorrhage from palm	108
Digital pressure on femoral artery	109
Tourniquet on femoral artery	111
Vertical section of head	139
The lungs and bronchial tubes	141
Artificial respiration (modification of Schafer's method)	144
Human crutch	181
Two-handed seat	182
Grip for two-handed seat	183
Carrying by two-handed seat	184
Fore and aft method of carrying	185
Grip for human stretcher	186

	page
Carrying by human stretcher	187
Grip for three-handed seat	188
Grip for four-handed seat	189
Furley stretchers	190
Stretcher Exercise No. I. "Stand to Stretcher"	193
Ditto No. I. "Collect Wounded"	193
Ditto No. I. "Lower Stretcher"	193
Ditto, ready to lift patient	194
Ditto, lifting patient	195
Ditto, placing stretcher	196
Ditto, lowering patient	197
Ditto, "March"	199
Ditto, changing numbers	200
Ditto, No. II. Ready to lift patient	202
Ditto, patient lifted	203
Ditto, No. III., first position	204
Ditto, second position	205

Appendices.

Roller bandage machine	214
Finger bandage	217
Spica for thumb	218
Reverse spiral for the forearm	219
Spica for right groin	220
Figure of 8 bandage for elbow	221
Figure of 8 bandage for leg	222
Many-tail bandage	223
Silvester's method of artificial respiration	225
Thomas splint	229

PREFACE.

AT the request of the Ambulance Committee of the Order of St. John, we have undertaken the revision of the Official First Aid Hand-Book of the St. John Ambulance Association, originally written by the late Colonel Sir James Cantlie, K.B.E., F.R.C.S., in 1901, subsequently revised by him in 1908 and by a Committee in 1917.

It has been our object to bring the Manual up to date without altering its general character and size and we have therefore made as few radical changes as possible.

Before beginning our task we invited criticisms of the existing textbook and suggestions for its revision, and a number have been received from Lecturers, Examiners and First Aiders in all parts of the world. All of them have been carefully considered by us and some have been embodied in the Manual: some were outside the scope of First Aid and we were therefore unable to adopt them. We take this opportunity of expressing our appreciation and thanks for the suggestions and criticisms received.

A. N. CAHUSAC (Chairman).
W. E. AUDLAND, M.R.C.S.
R. B. DUNCAN, M.D.
A. T. LAKIN, M.B.
I. G. MODLIN, M.D.

November, 1928.

INTRODUCTION.

The St. John Ambulance Association is a Foundation of the Grand Priory of the Venerable Order of St. John, and came into existence in 1877, although as early as 1872 tentative efforts to introduce an ambulance service in the Potteries had been made.

Certificates of proficiency after attendance at lectures and examination were granted in 1877 and the first manual of instruction was published in 1878, having been written for the Association by the late Surgeon-Major Peter Shepherd, M.B. So keenly was the work taken up, especially by miners, policemen and railwaymen, that in 1879 the Association introduced a system of re-examination for higher awards. The experience of a few years soon showed that there could be no finality in the scheme of the Association. Those who had received certificates and medallions exhibited a keen desire to utilise their knowledge in the service of the public. Many of them accordingly banded themselves together in units at various centres, and provided ambulance stations at National and International Exhibitions and other places where large crowds assembled. Thus originated the St. John Ambulance Brigade, which was eventually established by the Order of St. John in 1887.

In the meanwhile the Association had turned its attention to the manufacture and improvement of ambulance litters and stretchers. These latter were so designed as to fit all methods of transport and even in those early days it was possible for a patient to be conveyed across Europe without needing removal from the stretcher, or suffering from variations in transport.

No greater tribute to the work of the Association could have been paid than the granting of the Charter to the Order of St. John in 1888 by Her Majesty Queen Victoria.

Since its inception over fifty years ago the Association has issued to successful students in all parts of the world nearly two million certificates, which are recognised by the Home Office, Board of Trade, Admiralty, War Office and other Government Departments and Civil Authorities.

The St. John Ambulance Brigade, now numbering over 50,000 members, is universally recognised as a necessary unit of civil life, ready to serve on all occasions where accidents are liable to occur. The Brigade also provides fully trained persons for the Royal Naval Auxiliary Sick Berth Reserve, the Military Hospitals Reserve and Voluntary Aid Detachments.

Chapter I.

OUTLINE OF FIRST AID.

What First Aid is.

First Aid to the Injured is a special branch of practical medicine and surgery, by a knowledge of which trained persons are enabled to afford skilled assistance in cases of accident and sudden illness. The instruction begins and ends with First Aid, and the subject is taught simply, but thoroughly and exhaustively. The duty of the ambulance pupil ends where the doctor's begins, and there ought to be no overlapping or clashing of duty or interests.

In First Aid to the Injured it is essential :—

(a) To determine the nature of the case requiring attention so far as is necessary for intelligent and efficient treatment. In other words, to make a sufficient diagnosis for the purposes falling within the province of the First Aid student.

(a) To decide on the character and extent of the treatment to be given.

(c) To apply the treatment most suited to the circumstances until professional help is available.

Everything that has any bearing on the case should be considered as follows :—

1. The Patient or Patients.—The position assumed by the patient, either voluntarily or by force of circumstances, should not escape attention. More than one patient may need assistance, and discrimination will be necessary to ensure that the most pressing needs of each receive prompt attention.

2. Signs, Symptoms and History.—By "signs" are meant any differences from the normal condition of the patient, such as pallor, congestion, swelling, deformity, etc., which can be noted by the direct use of the senses—sight, touch, smell, hearing, and taste. (The sense of taste should very seldom, if ever, be used for this purpose.) "Symptoms" are the sensations of the patient such as pain, numbness, giddiness, hunger, etc., which he can, if conscious, describe; while "history," which may be obtained from the patient or from witnesses, means the circumstances attending the accident or sudden illness, such as a collision, fall, being subject to a particular disease, etc. Symptoms are less reliable than signs, as one patient will try to make light of a very severe injury while another will make the most of a trifle, and history must be considered trustworthy in proportion to the reliability of the source whence it is obtained.

Symptoms *taken alone* are not of much value for diagnosis, but though as a rule unpleasant, they have their uses, as warnings of something wrong, as guides to the seat of mischief and, in many cases, by their abatement or increased severity, as indications whether the treatment given is right or wrong.

Symptoms when considered in conjunction with the history of the case, are distinctly enhanced in diagnostic value.

When to the above there is added information gained by the observation of definite signs, the diagnosis rests upon a solid basis.

3. The Cause or Causes.—When a cause is known, a conclusion, more or less accurate, may be drawn as to its probable effects. But it must be remembered :—

(*a*) That a cause may have more than one effect. For example, two or more injuries may result from one accident.

(*b*) That the effect or effects may be direct or indirect. For example, a blood-vessel may break in the head, causing insensibility (direct effect). The patient will fall as the result of the bursting of the blood-vessel and a further injury may occur as the result of the fall (indirect effect).

(*c*) That the cause may be still active. For

example, a foreign body in the throat will continue to impede breathing as long as it remains there.

4. Surroundings.—These will exercise a most important bearing on the first aid to be given, and therefore require careful consideration on the following lines :—

(*a*) **Possible sources of danger.**—Fire, moving machinery, electric wires, poisonous gases, a restive horse, slippery objects, etc., may be present and necessitate the protection not only of the patient but also of the first aider and of third parties.

(*b*) **Possible clues to diagnosis.**—A broken ladder, stains of blood, escaping gas, bottles, etc., may afford useful suggestions. Objects suspected of having some connection with the patient's injury or illness should, compatibly with the pressing needs of the emergency, be examined and preserved for future reference.

(*c*) **The help available** depends in the first place on the presence or nearness of persons capable of helping, and in the second place upon the discrimination, explicitness and tact with which their efforts are directed. By the exercise of these qualities an inquisitive

crowd may be so controlled and instructed as to be of vital assistance to the patient.

The importance of making satisfactory provision for professional assistance cannot be too strongly insisted on. Discretion must be exercised as to sending for the doctor or taking the patient to him.

(*d*) **The appliances available.**—Appliances may be at hand in plenty, means of improvising may be adequate, or nothing but the actual resources of the patient and helpers may be available. The directions and illustrations which are given throughout this book are intended as a standard of treatment. It will frequently be impossible, for lack of appliances, to carry out the treatment exactly in the manner indicated. In such cases it will be necessary to comply with the principles of treatment in the best manner consistent with the actual circumstances.

(*e*) **The shelter.**—This word must be understood as including an extra wrap, or an umbrella, etc., as a temporary protection against the inclemency of the weather or fierce rays of the sun, as well as a shed, a private house, or a hospital. If the patient is to be taken to his home, a tactful message

thereto might enable suitable preparation to be made, and in any case would be an act of kindness to those concerned.

(*f*) **Means of transport available.**—Consideration of the best means of transport to shelter involves questions of appliances, length of journey, the nature of the ground to be traversed, and the best disposal of the help available for carrying the patient and making arrangements for proper after-care.

Necessary Qualifications of a First Aider.

In order to render the skilled assistance required the first aider should be—

(*a*) **Observant,** that he may note the causes and signs of injury.

(*b*) **Tactful,** that he may without thoughtless questions learn the symptoms and history of the case, and secure the confidence of the patient and bystanders.

(*c*) **Resourceful,** that he may use to the best advantage whatever is at hand to prevent further damage and assist Nature's efforts to repair the mischief already done.

(*d*) **Dextrous,** that he may handle a patient without causing unnecessary pain, and use appliances efficiently and neatly.

FIG. 1.—THE EIGHT-POINTED AMBULANCE CROSS.

(*e*) **Explicit,** that he may give clear instructions to the patient or the bystanders how best to assist him.

(*f*) **Discriminating,** that he may decide which of several injuries presses most for treatment by himself, which can best be left for the patient or the bystanders, and which should be left to the medical man.

(*g*) **Persevering,** that he may continue his efforts, though not at first successful.

(*h*) **Sympathetic,** that he may give real comfort and encouragement to the suffering.

Principles of First Aid.

1. Death is not to be assumed because signs of life are absent.—It may happen that even a medical man is unable to say positively whether a patient is alive or dead; far less can the First Aid student form a decision. It is much better to treat a dead body than to allow a living person to die for want of First Aid.

2. Remove the cause of injury or danger whenever possible, or, when more expedient, the patient from the cause.

3. Severe hæmorrhage must receive the

first attention, no matter what are the other injuries.

4. Air.—The patient must be in a position in which breathing is possible; the air passages must be free from obstruction; if breathing has ceased prompt measures must be taken to restore it.

5. Rest.—A restful position of the body will assist the vital functions. The position assumed by the patient should not be thoughtlessly altered. Support of the injured part will help to prevent further damage. The use of pillows in this connection is much to be commended.

6. Warmth.—After every accident keep the patient warm, so as to prevent the fall of temperature below the normal point (98.4 degrees Fahrenheit).

7. When the skin is broken the wound should be promptly covered with a clean absorbent dressing. Should the wound be poisoned, it is most important to prevent the poison permeating the system.

8. Poisons swallowed should be got rid of, or when that is inexpedient, neutralised.

9. The best means of transport must be studied, and provision made for proper care when the patient is brought to shelter.

10. Removal of clothing.—Clothes should not be taken off unnecessarily, but when it is needful to

remove them, the following rules will be found of service in serious cases :—

Coat : Remove from the sound side first, and if necessary, slit up the seam of the sleeve on the injured side.

Shirt and Vest : Slit down the front and remove as the coat.

Trousers : Slit up the outer seam.

Boot : Steady the ankle and undo the laces.

Sock : Cut off.

11. Stimulants.—It is incorrect to suppose that alcohol is the only form of stimulant, and far too frequent use of spirits is made to restore a patient after an accident, often with serious results ; the safest rule, therefore, is to defer the administration of alcohol until the arrival of a doctor. When the patient is able to swallow, strong tea or coffee, meat extracts or milk, as hot as can be drunk, or a teaspoonful of sal volatile in half a tumbler of water may be given. Smelling salts, the strength of which should first be tested, may be held to the nose. Sprinkling the face with cold and hot water alternately, warmth applied to the pit of the stomach and over the heart, and vigorous friction of the limbs upwards have a stimulating effect.

12. Throughout his work the First Aid Student must on no account take upon himself

the duties and responsibilities of a Doctor.—At times an apparently slight injury is accompanied by grave danger or may easily be aggravated by rough or unskilful treatment, and may actually cause loss of life. When sending for a doctor, state the nature of the case, the whereabouts of the patient, and, if it is intended to move him at once, the destination and the route to be followed. Written particulars are safer than a verbal message.

QUESTIONS ON CHAPTER I.

The numerals indicate the pages where the answers may be found.

FRONTISPIECE.

When describing the body how is it supposed to be placed ?

If a person raises his arm above his head, which is considered to be the upper part of that limb ? (Answer : The shoulder)

What is the middle line of the body ?

PAGE

What is First Aid to the injured ? 11

What are the essentials of First Aid ? 11

In dealing with a patient or patients, what is necessary and why ? 12

Explain signs, symptoms and history 12

PAGE

What is their value, separately or together? .. 13
What must you bear in mind in drawing conclusions from a known cause? 13
State fully how the surroundings of the patient may influence First Aid.. 14
What qualifications should a First Aider possess? 16
Is absence of signs of life proof of the presence of death? 18
What is often the first thing to do in an accident? 18
What result of injury must receive the first attention? 18
What three things are generally necessary for an injured person? 19
What should be done when the skin is broken? .. 19
How should poisoning be treated? 19
What steps must be taken beyond the actual treatment of injuries? 19
How would you remove clothing when necessary from an injured person? 19
Explain the use and abuse of stimulants 20
What precaution would you take before using smelling salts? 20
What must the First Aider never do? 20

Chapter II.

BANDAGES.

Bandages form an important part of First Aid treatment, **the Triangular Bandage** being generally used.

It may be applied to keep a dressing in position, to support an injured part, and as a sling.

Triangular Bandages (Fig. 2) are made by cutting a piece of linen or calico about forty inches square diagonally into two pieces.

The broad bandage is made by bringing the point down to the base (Fig. 3), and then folding into two (Fig. 4).

The narrow bandage is made by folding the broad bandage once (Fig. 5).

It is sometimes advisable to halve the size of the triangular bandage by bringing the two ends together before folding it into the broad or narrow bandage.

To secure the ends of a triangular bandage **Reef Knots** (Fig. 6) should be used. Granny knots (Fig. 7) are apt to slip and must be avoided. After the reef knot is completed, the ends of the bandage should be tucked in.

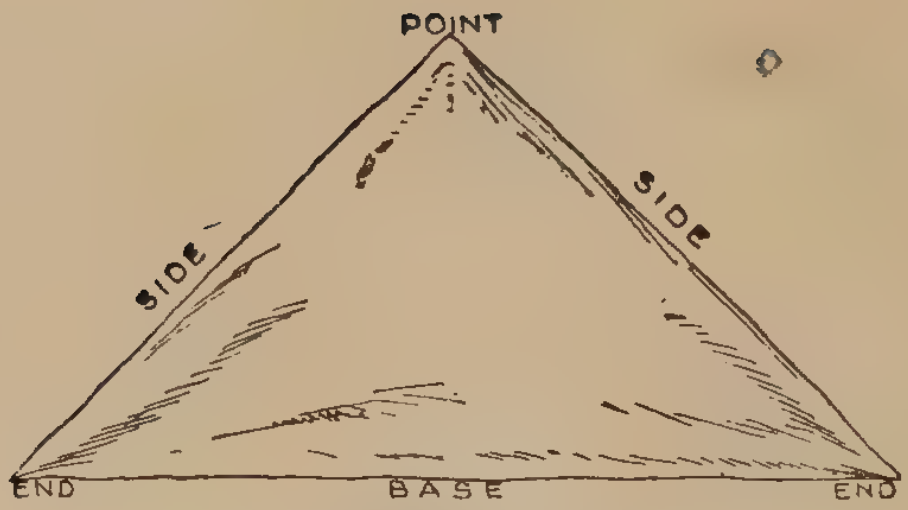


FIG. 2.—BANDAGE SPREAD OUT.

FIG. 3.—BANDAGE ONCE FOLDED.

FIG. 4.—BROAD BANDAGE.

FIG. 5.—NARROW BANDAGE.

Bandages may be improvised from handkerchiefs, belts, straps, braces, neckties, or any piece of linen, calico, tape or cord that comes to hand

FIG. 6.—REEF KNOT.

FIG. 7.—GRANNY KNOT.

Large arm sling (Fig. 8).—Supports the forearm. Spread out a triangular bandage, put one end over the shoulder on the sound side, pass it round the neck so that it appears over the shoulder of the injured side, and let the other end hang down in front of the chest ; carry the point behind the elbow of the injured limb, and place the forearm over the middle of the bandage ; then carry the second end up to the first and tie them ; bring the point forward, and secure with two pins to the front of the bandage.

Small arm sling (Fig. 9).—Supports the wrist but allows the elbow to hang freely. Place one end

of a broad bandage over the shoulder on the sound side, pass it round the neck so that it appears over the shoulder of the injured side; place the wrist over the middle of the bandage so that the front edge covers the base of the little finger; then bring the second end up to the first, and tie them.

FIG. 8.

FIG. 9.

St. John sling.—Keeps the hand well raised. (The following instructions apply in the case of an injury on the left side. When the injury is on the right side, substitute the word "left" for "right" and "right" for "left.")

(*a*) Place the patient's left forearm diagonally across the chest so that his fingers point towards the right shoulder and the palm rests on the breast-bone.

(*b*) Holding an unfolded bandage with its point in the right hand and one end in the left hand, lay the bandage over the left forearm with the point well beyond the elbow, and the end in the left hand on the right shoulder (Fig. 10).

(*c*) Whilst supporting the left elbow, tuck the base of the bandage well under the left hand and forearm and carry the lower end across the back to the right shoulder, allowing the point to hang loosely outwards ; tie the ends in the hollow above the right collar-bone.

(*d*) With your left hand hold open the side of the bandage lying on the left forearm, and with your right hand tuck the point well in between the left forearm and the side of the bandage which you are holding open.

(*e*) Carry the resulting fold round over the back of the arm, and firmly pin it to a part of the bandage running up the back (Figs. 11 and 12).

FIG. 10.

FIG. 11.

FIG. 12.

Slings may be improvised in many simple ways, such as pinning the sleeve to the clothing, turning up the lower edge of the coat, passing the hand inside the buttoned coat or waistcoat, etc.

Application of Bandages.

For the Scalp (Fig. 13). Fold a hem inwards about 1½ inches deep along the base of a bandage; place the bandage on the head so that the hem lies on the forehead **close down to the eyebrows,** and the point hangs down at the back; carry the two ends round the head **above** the ears and tie them on the forehead; steady the head with one hand and with the other draw the point of the bandage downwards; then turn it up and pin it to the bandage on the top of the head.

Fig. 13.

For the Forehead, Side of the Head, Eye, Cheek, and for any part of the body that is round (as the arm or thigh, etc.), the narrow bandage should be used, its centre being placed over the

dressing, and the ends carried round the head or limb, as the case may be, and tied.

For the Shoulder (Fig. 14). Place the centre of a bandage on the shoulder, with the point running up the side of the neck ; fold a hem inwards along

FIG. 14.

the base ; carry the ends round the middle of the arm and tie them. Place one end of a broad bandage over the sound shoulder and sling the arm by carrying the other end over the point of the first

bandage and tying the ends at the side of the neck; turn down the point of the first bandage over the knot, draw it tight and pin it.

For the Hip (Fig. 15). Tie a narrow bandage round the body above the haunch bones, with the knot on the injured side. Carry the point of a

FIG. 15.

second bandage under the first bandage and turn it down over the knot. Fold a hem inwards according to the size of the patient along the base of the second bandage, carry the ends round the

thigh and tie them; fix the point of the bandage with a pin.

For the Hand when the fingers are extended (Fig. 16). Fold a hem inwards along the base of a bandage; place the wrist on the hem with the fingers towards the point; them bring the point over the wrist, pass the ends round the wrist, cross and tie them; bring the point over the knot and pin it to the bandage over the hand.

Fig. 16.

Fig. 17.

For the Foot (Fig. 17). Place the foot on the centre of the bandage with the toes towards the point; draw up the point over the instep, bring the ends forward and cross them; pass the ends round

the ankle and tie them. Draw the point forward and pin it to the bandage over the instep.

For the Front of the Chest (Figs. 18 and 19). Place the middle of the bandage over the dressing with the point over the shoulder on the same side,

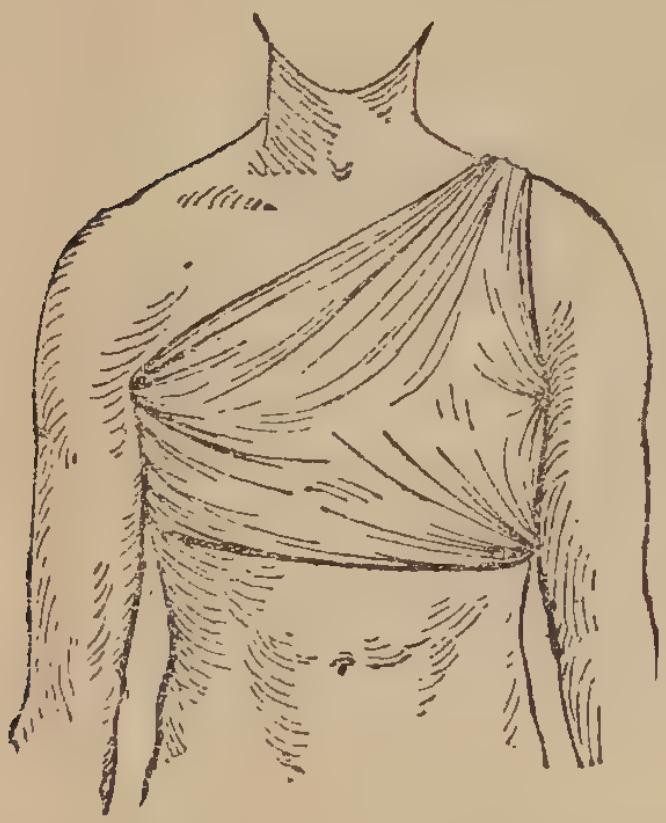


FIG. 18.

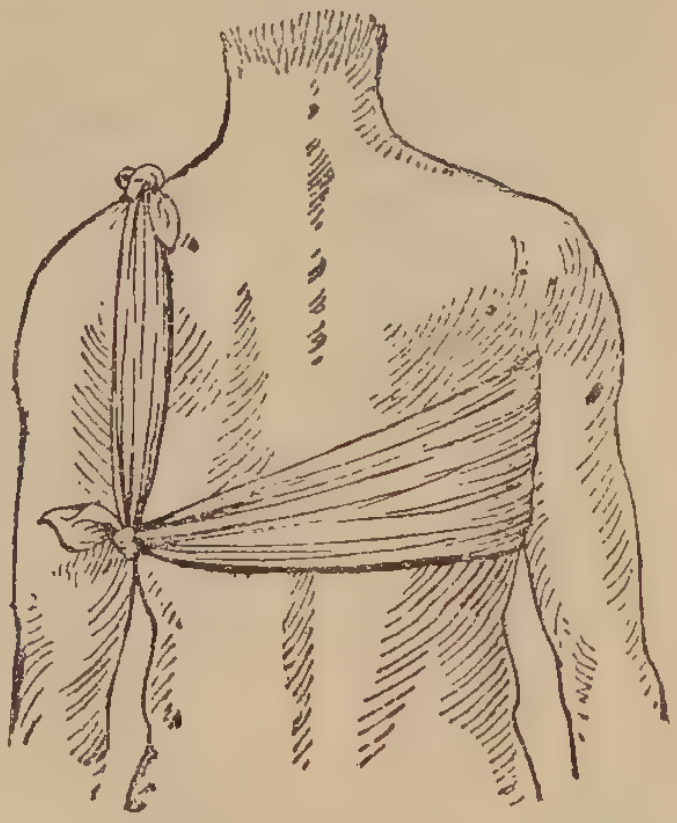


FIG. 19.

carry the ends round the waist and tie them, leaving one end longer than the other; then draw the point over the shoulder and tie it to the longer end. A hem along the base of the bandage is often useful.

For the Back. The bandage is applied as the foregoing, except that it is begun at the back.

FIG. 20.

For the Knee. Fold a narrow hem inwards along the base of a bandage; lay the point on the thigh and the middle of the base just below the knee-cap; cross the ends first behind the knee, then round the thigh and tie them (Fig. 20). Bring the point down and pin it to the base.

For the Elbow. Fold a narrow hem inwards along the base of a bandage; lay the point on the back of the arm and the middle of the base on the back of the forearm; cross the ends first in front of the elbow, then round the arm and tie them (Fig. 21). Bring the point down and pin it.

FIG. 21.

When not in use, the triangular bandage should be folded narrow; the two ends should be turned to the centre, and the bandage then folded into four, reducing it to a packet about 6½ inches by 3½ inches.

QUESTIONS ON CHAPTER II.

The numerals indicate the pages where the answers may be found.

	PAGE
Describe the triangular bandage	23
In what ways is the triangular bandage used ? ..	23
In what ways may the triangular bandage be folded for use ?	23
What knot is to be tied, and what knot avoided ? ..	23
How may bandages be improvised ?	24
How many kinds of arm slings are there, and what are they called ?	25
How may slings be improvised ?	29

Practice

	PAGE
Improvising bandages	24
Tying knots	25
Making and improvising slings	29
Application of bandages	29

Chapter III.

STRUCTURE AND FUNCTIONS OF THE BODY.

In order to understand fully the principles of First Aid it is necessary that something should be known of the structure of the body (anatomy), and the functions of some of the more important organs and systems (physiology).

THE STRUCTURE OF THE BODY.

The Skeleton.

The human body is moulded upon a bony framework (the skeleton) which serves—

1.—To give shape and firmness to the body.
2.—To afford attachment to the muscles.
3.—To protect important organs, as in the skull, chest and abdomen.

The Skull.

The Bones of the Skull are arranged in two groups, those of the brain case (Cranium) and those of the face.

The Boundaries of the Cranium are the vault or dome, the rounded portion forming the top of the

head; the front or brow; the back of the head, where the greatest extent of brain exists, and where therefore the cranium is widest and deepest; the sides or temples. The base of the skull is hidden from view by the bones of the face and of the spinal column; in it are numerous openings for the passage of blood vessels and nerves; through the largest opening the brain and spinal cord are continuous.

The Bones of the Head and Face with the exception of the lower jaw are firmly united, so that movement between them is impossible. The cavities of the nose and of the eye sockets (Orbits) are formed by the bones of the cranium and of the face conjointly. The mouth cavity is formed between the upper and lower jaws, the palate being the bony roof of the mouth which separates it from the nasal cavity above.

The Lower Jaw consists of :—

(*a*) A horizontal portion in which are the sockets for the teeth.

(*b*) Vertical portions terminating on either side at the joint between the lower jaw and the base of the skull situated immediately in front of the ear.

The angle of the jaw indicates the junction of the horizontal and the vertical portions.

The Back-bone or Spine (Vertebral Column).

The Spine (Fig. 22) is composed of bones called vertebræ, each of which consists of a body or bony mass in front, from the sides of which processes extend backwards and unite to form the spinal canal, which encloses the spinal cord (Figs. 23 and 24).

The Vertebræ, 33 in all, are grouped into regions in each of which they are known by numbers, counting downwards :—

1.—In the neck 7 Cervical vertebræ. The first vertebra (Atlas) forms a joint with the base of the skull, at which the nodding movement of the head takes place; the second (Axis), by means of the joint between it and the atlas, permits the side-to-side movements of the head.

2.—In the back 12 Thoracic vertebræ, to which the ribs are attached.

3.—In the loin 5 Lumbar vertebræ.

4.—The rump-bone (Sacrum) consists of 5 Sacral vertebræ united in adults as a solid mass

5.—The tail-bone (Coccyx) consists of 4 vertebræ joined together.

FIG. 22.

SKULL AND VERTEBRAL COLUMN.

Showing left ribs and portion of breast bone. The right ribs are removed.

FIG. 23.

THORACIC VERTEBRA.

FIG. 24.

SIDE VIEW OF A THORACIC VERTEBRA.

Between the bodies of the vertebræ, in the upper three regions, are interposed thick pieces of gristle (cartilage), which allow of free movement to the column as a whole, and help to break the shock of any sudden force applied to the spine (for example, when falling from a height on the feet). The whole spine is strapped together by bands of strong fibrous tissue (ligaments) reaching its entire length.

The Ribs and Breast-bone.

The Ribs consist of twelve pairs of curved bones extending from the thoracic vertebræ to the front of the body, and are known by numbers—first, second, etc., commencing from above. The ribs are not bony throughout their entire length, but at a short distance from the front the bony material ends, and cartilage takes its place. The upper seven pairs, called the "true" ribs, are attached by their cartilages to the **Breast-bone** (Sternum), a dagger-shaped bone with the point downwards, just above the pit of the stomach. The lower five pairs of ribs are called "false." Of these the upper three pairs are attached by cartilage to the ribs immediately above them. The last two pairs are unattached in front and are called "floating." The ribs enclose the chest and serve to protect the lungs, heart, liver, stomach, spleen, etc.

The Upper Limbs.

The Shoulder-bones are the Collar-bone (Clavicle) and the Shoulder-blade (Scapula).

The Collar-bone can be felt on either side beneath the skin at the lower and front part of the neck as a narrow curved rod about the thickness of a finger. Its inner end is attached to the upper part of the breast-bone, and its outer end joins with the shoulder-blade.

The Shoulder-blade lies at the upper and outer part of the back of the chest, and forms joints with the collar-bone and the bone of the arm.

The Bone of the Arm (Humerus) reaches from the shoulder to the elbow.

In the **Forearm** are two bones, one on the outer, or thumb side (Radius) and the other on the inner, or little finger side (Ulna). Both bones reach from the elbow to the wrist, and they change their relative position with every turn of the hand (Figs. 25 and 26).

The Hand is composed of—

1.—The bones of the wrist (Carpus), eight in number, arranged in two rows of four.

2.—The framework of the palm (Metacarpus); five bones which form the knuckles and support the bones of the fingers.

3.—The finger-bones (Phalanges), three in each finger, and two in the thumb.

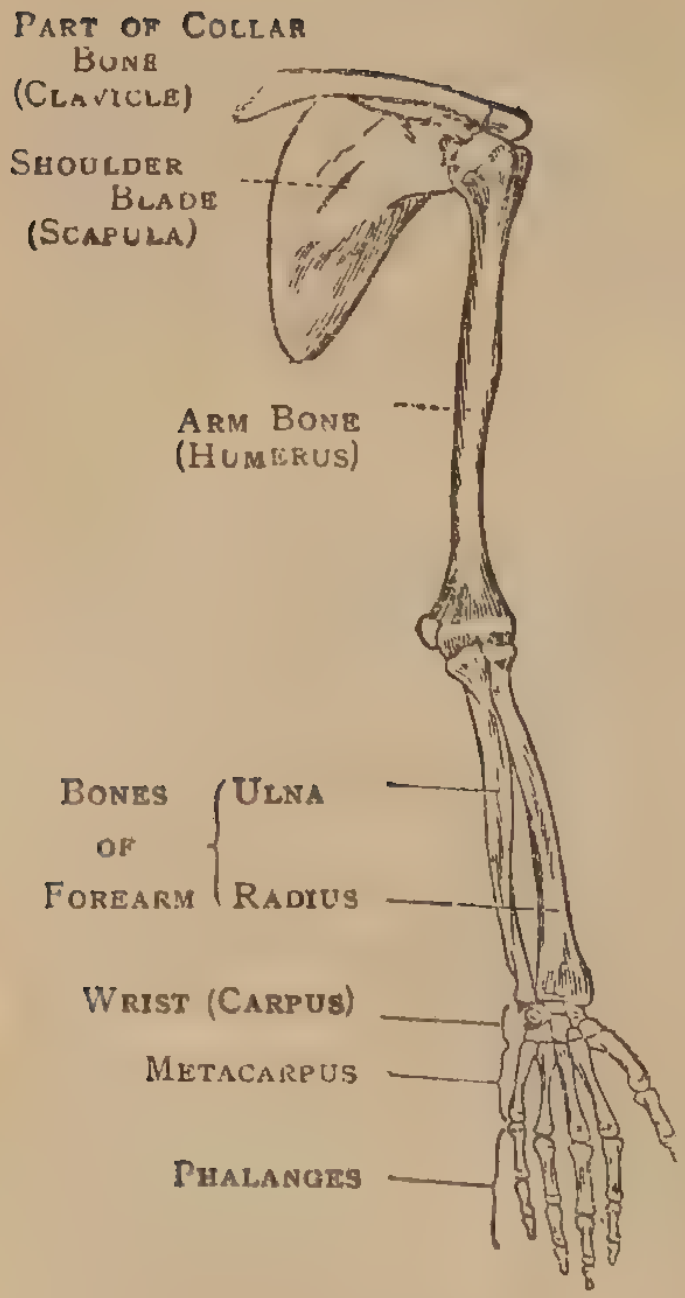


Fig. 25.

Bones of the left Upper Limb.

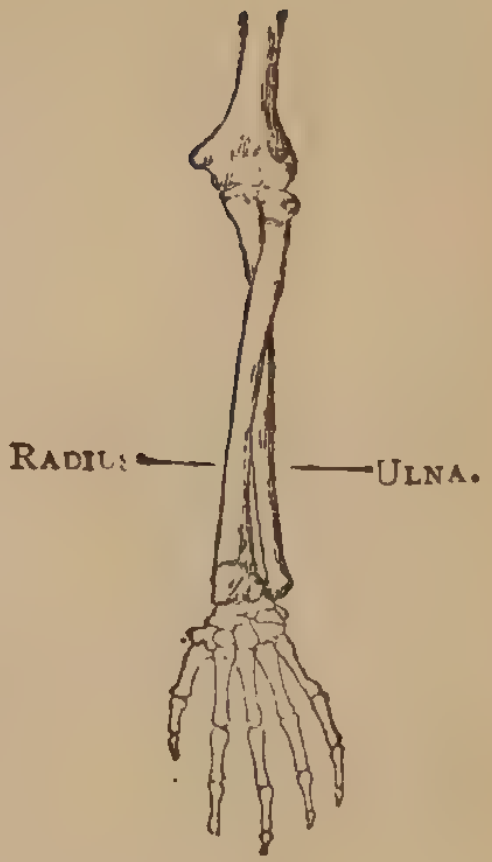


Fig. 26.

Showing the position of the Radius and Ulna when the Thumb is turned inwards.

(Compare Fig. 25, in which the thumb is turned outwards.)

The Pelvis and Lower Limbs.

The Pelvis.—The large basin-like mass of bone attached to the lower part of the spine i composed of the two haunch-bones, the sacrum and the coccyx. The haunch-bones meet at the front (Pubes) in the middle line, only a small piece of cartilage intervening, but behind, the sacrum is placed between them. The pelvis supports the abdomen and its contents, and provides the deep sockets for the hip-joints.

The Thigh-bone (Femur) reaches from the hip to the knee-joint. Its shaft is stout, rounded, and arched forwards; the upper end presents a rounded head, supported on a neck which projects inwards, to fit into the socket of the haunch bone; the lower end broadens and enters into the formation of the knee-joint.

The Knee-cap (Patella) is a flat triangular bone lying with its base upwards in front of the knee-joint immediately beneath the skin.

The Bones of the Leg are the Shin-bone (Tibia) and the Brooch-bone (Fibula). The **Shin-bone** extends from the knee to the ankle, in both of which joints it plays an important part: its sharp edge can be felt immediately beneath the skin of the front of the leg. The **Brooch-bone** lies on the

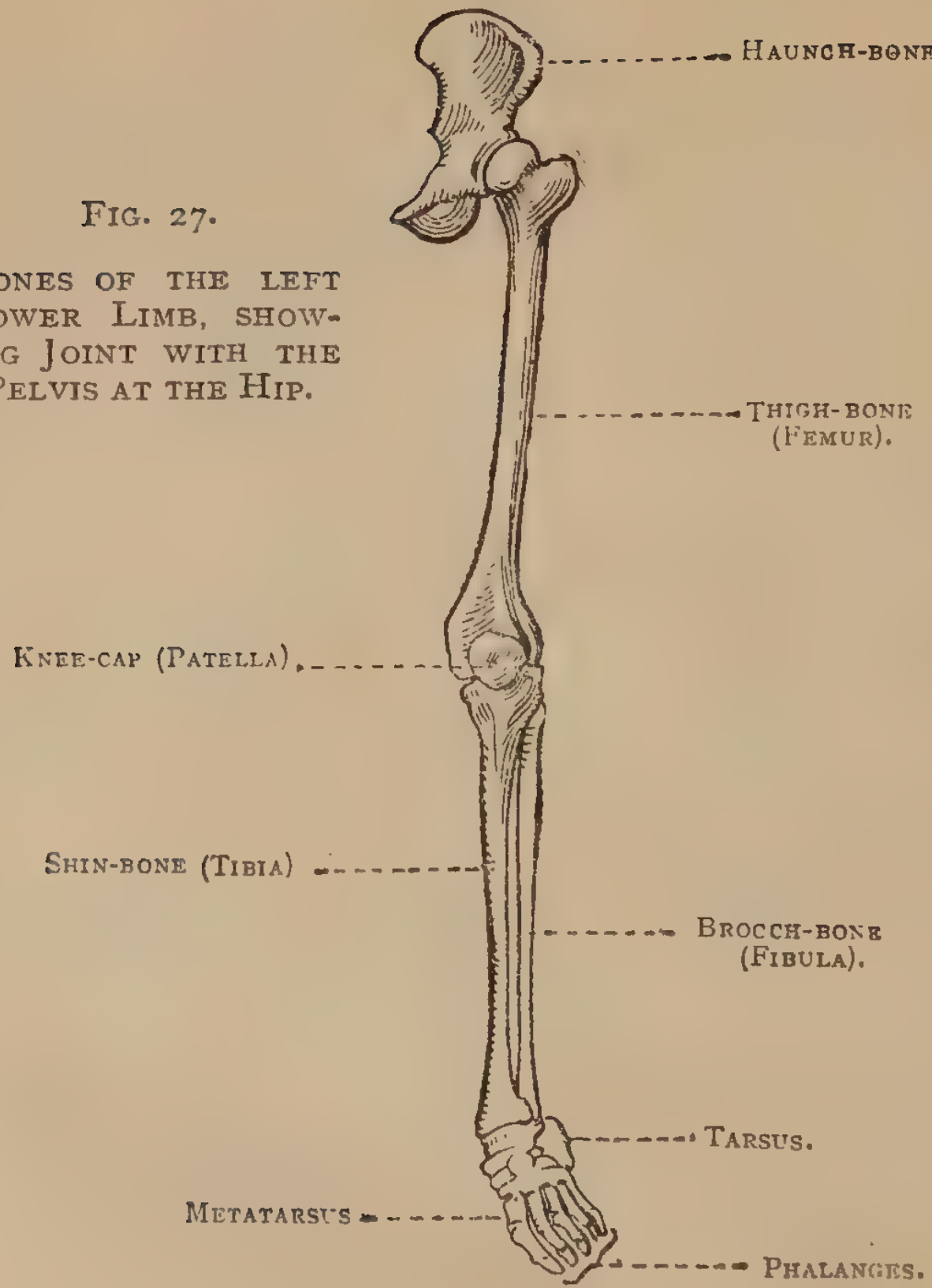


Fig. 27.

Bones of the left Lower Limb, showing Joint with the Pelvis at the Hip.

outer side of the tibia. It does not enter into the formation of the knee-joint, but its lower end forms the outer part of the ankle-joint.

The Foot is composed of—

1.—A group of seven irregular bones (Tarsus) at the instep. The largest is the heel-bone, and the uppermost (the ankle-bone) forms the lower part of the ankle joint.

2.—The five long bones in front of the tarsus (Metatarsus) which support the toes.

3.—The toe-bones (Phalanges), two in the big toe, and three in each of the other toes.

Joints.

A Joint is formed at the junction of two or more bones. In joints such as the hip, knee, elbow, etc., the surfaces of the bones are covered by cartilage, which lessens friction and the shock of a fall. The ends of the bones forming a joint are enclosed in a bag of strong tissue (capsule). This is strengthened by bands of similar tissue (ligaments) which hold the bones in position and allow of free movement. Within the capsule is a lining (synovial membrane), whose function is to secrete fluid (synovial fluid), which is always present inside the joint and acts as a lubricant.

The following examples of joints are given :—

1.—**Ball and Socket Joints** (Fig. 28), in which the rounded head of one bone fits into a cup-shaped cavity formed by the other bone entering into the joint, such as the Shoulder and Hip. In these joints very free movement is allowed and they are frequently dislocated.

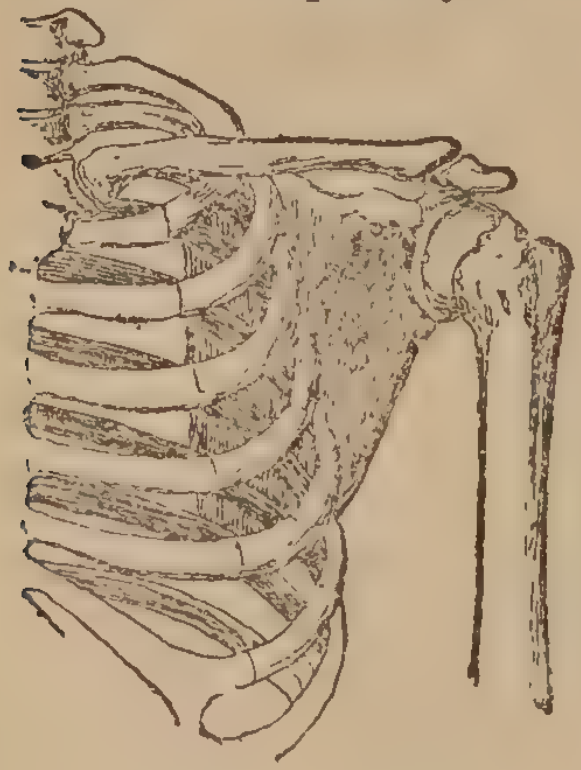


FIG. 28.

FIG. 29.
LEFT ANKLE.

2.—**Hinge Joints** (Fig. 29), in which the surfaces of the bones are moulded to each other in such a manner as to permit only bending (flexion) and straightening (extension), such as the Elbow, Knee and Ankle. In these joints considerable force is necessary to cause a dislocation.

In the knee-joint are two flat crescentic pieces of cartilage (semi-lunar cartilage) which lie on the upper end of the tibia, and deepen the surface for the rounded ends of the femur. In sudden wrenches of the knee, such as are met with in football and other games or in slipping off a step, these cartilages may be displaced or torn.

The Tissues.

The Muscles (red flesh) of the body are classified into two groups—voluntary and involuntary.

The Voluntary Muscles are met with in the limbs, the head and neck, and the walls of the trunk. They are attached to the bones either directly or by strong bands of white fibrous tissue (tendons), and have the power of contracting, i.e., getting shorter and thicker. They cause all the movements of the body and limbs, and are controlled by the brain, which sends messages (impulses) through the nerves to any muscle or group of muscles which it wishes to call into action. In this way all movements, such as walking or swallowing, are performed

The Involuntary Muscles are met with in the walls of the stomach and intestines, in the air passages, and in most of the internal organs and blood vessels; also, in a special form, in the heart. They are not under the influence of the will, but continue their work during the hours of sleep; their

functions are regulated by a separate set of nerves (Sympathetic System, see page 153).

Connective Tissue consists of yellow elastic and white fibrous tissue intermixed in varying proportions. It is present in many parts of the body and forms a layer between the skin and underlying flesh all over the body, fat being contained between its meshes, often in large quantities. The chief use of the connective tissue is to bind parts together.

The Skin covers the whole of the body and protects the underlying structures. It consists of two layers, the outer and hard layer (cuticle) and the inner layer (true skin or dermis). In the latter are numerous glands which secrete sweat; this consists of water and impurities from the blood, the evaporation of which from the surface of the skin cools and helps to regulate the temperature of the body.

The Trunk and its Contents.

The Trunk is divided by a large arched muscular partition (**Diaphragm**) into two large cavities.

The upper cavity, the **Chest** (Thorax) is bounded in front by the breast-bone; behind by the spine; below by the diaphragm, and is encircled by the ribs. It contains the **Heart** and **Lungs.**

The lower cavity, the **Abdomen,** is bounded above by the diaphragm; below by the pelvis; behind by the lumbar vertebræ; and in front and at the sides

by muscular walls (Fig. 30). It contains several important organs, namely, the **Stomach**, just below the diaphragm towards the left side; the **Liver**, in the upper part of the abdomen, where it is mostly covered by the right lower ribs; the **Spleen**, beneath the ribs at the upper part of the left side of

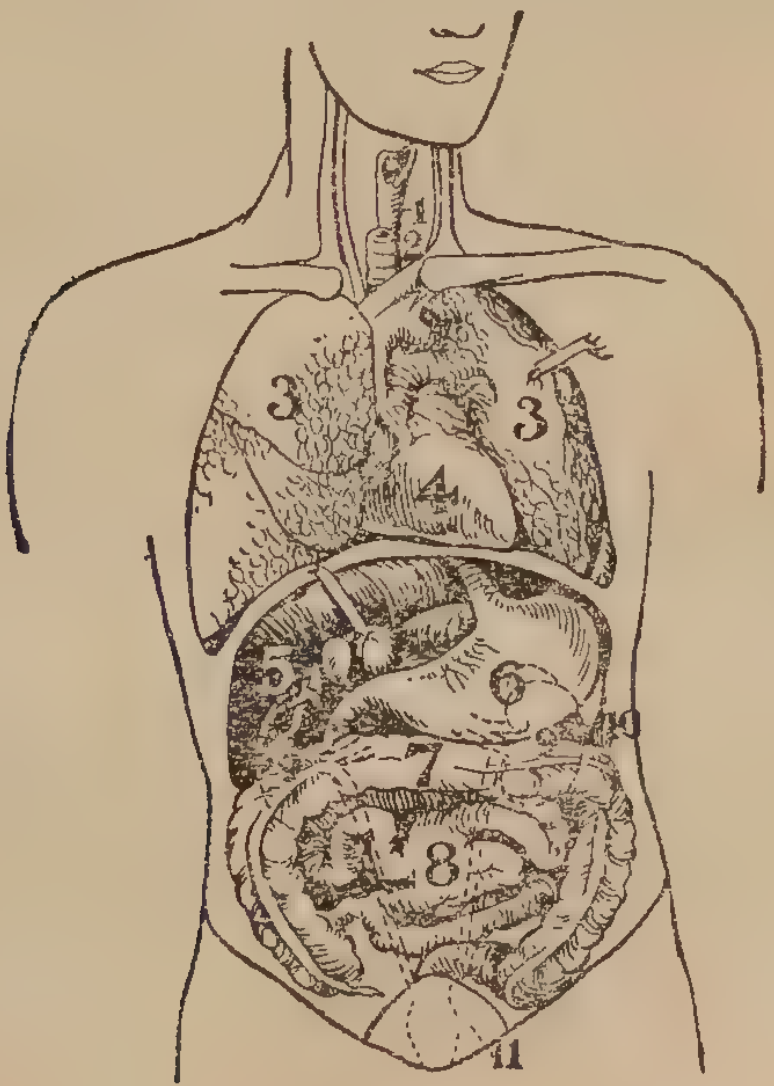


FIG. 30.

1.—ŒSOPHAGUS OR GULLET. 2.—TRACHEA OR WINDPIPE. 3-3.—RIGHT AND LEFT LUNGS. 4.—HEART. 5.—LIVER. 6.—STOMACH. 7.—LARGE INTESTINE. 8.—SMALL INTESTINE. 9-9.—RIGHT AND LEFT KIDNEYS 10.—SPLEEN. 11.—BLADDER.

the abdomen; **the Pancreas,** behind the stomach; the **Intestines,** which occupy the greater part of the cavity of the abdomen; the **Kidneys,** at the back, one at each side, in the region of the loin, and the **Bladder** which lies to the front in the pelvis.

FUNCTIONS OF THE BODY.

The body requires fuel and new material to repair its wear and tear. These are obtained from the food eaten—fats such as cream and butter, and starches such as bread and vegetables, to provide the fuel, and nitrogenous foods such as meat, beans and cheese, to make good the wear and tear. These are digested in the mouth, stomach and bowels and changed so that they can be easily absorbed by the blood. Oxygen, too, is necessary to support life. This is obtained from the air we breathe in respiration, and is absorbed in the lungs. The waste products are removed through the skin, lungs, kidneys and bowels.

The great carrier is the blood, which conveys the fresh supplies of nourishment and oxygen to the whole of the body from the lungs and organs of digestion, and also the waste products to the organs of excretion.

All these movements and functions of the body are regulated and controlled by two systems of **Nerves,** the Cerebro-spinal and the Sympathetic.

QUESTIONS ON CHAPTER III.

The numerals indicate the pages where the answers may be found.

	PAGE
What are anatomy and physiology?	36
What is the skeleton, and what purposes are served by it?	36
How are the bones of the skull arranged?	36
What are the boundaries of the cranium?	36
Describe the bones of the head and face	37
Describe the lower jaw	37
What is the angle of the jaw?	37
What other names has the back-bone?	38
Describe a vertebra	38
How many vertebræ are there in the spine? ..	38
What are the regions of the spine, and how many vertebræ are there in each?	38
How is the spine endowed with free movement? ..	40
What is a rib?	40
How many pairs of ribs are there and how are they named?	40
What is the breast-bone?	40
What are the bones of the upper limbs?	41
What is the pelvis?	43
What is the hip-joint?	43
What are the bones of the lower limbs?	43
How is a joint formed?	45
Describe a ball and socket joint.	46
Describe a hinge joint	46
How are muscles classified?	47
Where are voluntary muscles found?	47
Where are involuntary muscles found?	47

PAGE

How do they differ from voluntary muscles ? .. 48
What is connective tissue ? 48
Where is connective tissue found ? 48
What is its chief use ? 48
Describe the skin 48
What divides the trunk into two cavities ? .. 48
What are the boundaries of the chest ? 48
What does the chest contain ? 48
What are the boundaries of the abdomen ? .. 49
What important organs does the abdomen contain ? 49
What does the body require and how is it obtained ? 50
What organs remove the waste products ? .. 50
What does the blood convey ? 50
Name the two systems of nerves and state their functions 50

Chapter IV.

FRACTURES.

When a bone is broken a Fracture is said to occur.

Causes of Fracture.

1. Direct Violence.—When from a severe blow, impact of a bullet, crush of a wheel, etc., a bone breaks at the spot where the force is applied, the fracture is termed direct.

2. Indirect Violence.—When the bone breaks at some distance from the spot where the force is applied, the fracture is termed indirect. Al ghting on the feet and fracturing the thigh-bone or the bones of the leg, or falling on the hand and breaking the radius or the collar-bone, are examples.

3. Muscular Action.—The knee-cap and the arm-bone are occasionally broken by a sudden violent contraction of the muscles attached to them.

Varieties of Fracture.

Fractures are classified in two ways:—

(A) According to the **condition of the tissues** adjacent to the bone:—

1. Simple.—The bone is broken with only slight injury to the surrounding tissue.

2. Compound.—The bone is broken and the skin and tissues are punctured or torn, thus allowing disease-producing germs to obtain access through the external wound to the seat of fracture. The fractured ends may protrude through the skin, or the wound may lead down to the fracture (for example, when a bone is broken by a bullet).

3. Complicated.—The bone is broken and in addition there is an injury to some internal organ (for example, the brain, spinal cord, lung, etc.) or to some important blood-vessel or nerve.

A fracture may be compound or complicated as the immediate result of the injury; or a fracture, originally simple, may be converted into a compound or complicated fracture—

(*a*) by careless movement on the part of the patient, or

(*b*) by carelessness or ignorance on the part of one rendering first aid.

(B) According to the **injury to the bone** itself:—

1. Comminuted.—The bone is broken into several pieces, and therefore requires special care in handling.

2. Green-stick.—In children, owing to the softer state of the bony tissues, a bone may bend and crack without breaking completely across.

3. Impacted.—The broken ends of the bone are driven one into the other.

General Signs and Symptoms of Fracture.

1. Pain at or near the seat of fracture.

2. Loss of power in the limb.

3. Swelling about the seat of fracture.—Swelling frequently renders it difficult to perceive other signs of fracture, and care must therefore be taken not to mistake a fracture for a less serious injury.

4. Deformity of the limb.—The limb assumes an unnatural position, and is mis-shapen at the seat of fracture. The contracting muscles will probably cause the broken ends of the bone to override, thereby producing shortening.

5. Irregularity of the bone.—If the bone is close to the skin the fracture may be felt, and if compound it may be seen.

6. Unnatural Mobility.—Movement may be noticed at the seat of fracture.

7. Crepitus, or bony grating, may be felt or heard when the broken ends move one upon the other.

The last two signs should be sought only by a doctor, and are absent in green-stick and impacted fractures.

In addition to the signs and symptoms the patient or the bystanders may be able to give the history of the injury ; and marks on the clothing or skin should

be noted, as they may serve to locate the fracture. The snap of the bone may have been heard or felt.

The object of First Aid Treatment of Fractures is to guard against further injury or aggravation, especially to prevent a simple fracture from becoming compound or complicated.

General Rules for Treatment of Fracture.

1. Attend to the fracture on the spot. No matter how crowded the thoroughfare, or how short the distance to a more convenient or comfortable place, no attempt must be made to move the patient until the limb has been rendered as immovable as practicable by splints or other means of restraint, unless life is in danger from some other cause.

2. When hæmorrhage accompanies a fracture it must be attended to first, and the wound covered by a clean dressing (see page 93).

3. Steady and support the injured limb so that its further movement on the part of either the patient or the bystanders is prevented.

4. Treat shock (see page 161 .

5. With great care and without using force place the limb in as natural a position as possible, and, if shortening is observed in the case of fracture of a bone of the lower limb, place one hand

behind the heel and the other on the instep and pull evenly upon the foot (extension) until the limb regains a more normal length. When the limb is straightened, on no account let go until it is secured in position by splints, otherwise there is great danger of the fracture becoming compound or complicated. Do not attempt extension in the case of a compound fracture when the bone protrudes.

6. Apply splints, bandages and slings when necessary as follows :—

(*a*) The splints must be firm, and long enough to keep the joints immediately above and below the fractured bone at rest. They should, if practicable, be padded to fit accurately to the limb and be applied over the clothing. Ample width is very desirable in a splint. A splint may be improvised from a walking stick, umbrella, billiard cue, broom or brush handle, policeman's truncheon, rifle, folded coat, piece of wood, cardboard, paper firmly folded, a rolled-up map, or, in fact, *anything that is firm, long and wide enough to keep the joints immediately above and below the fractured bone at rest.* When the above appliances are not readily available, the upper limb, if fractured, may be tied to the trunk, and in all

cases a fractured lower limb should be bandaged to its fellow.

(*b*) The bandages must be applied firmly, but not so tightly as to constrict the circulation of blood in the limb. When the patient is in the recumbent position double the bandage over a splint to pass it under the trunk or lower limb, using the natural hollows of the body (the neck, loins, knees and just above the heels) to avoid jarring. As a general rule :—

For the trunk the broad bandage should be used. Pass it once round the trunk and fasten it by tying the ends (or with two or three safety pins) on the side opposite to the fracture, but if to secure a splint for a broken thigh, tie or fasten the ends over the splint.

For the limbs the narrow bandage should be used. Pass it twice round the limb, and tie the ends over the outer splint ; or it may be more convenient to double the bandage at the centre, pass it under the limb, bring the loop over the limb, pass both ends of the bandage through it in opposite directions, and tie them over the outer splint (Loop bandage, Fig. 31).

FIG. 31.—LOOP BANDAGE.

In applying bandages near a fracture the upper one should be secured first.

(*c*) Slings, when necessary, should be applied as described in Chapter II.

7. Make no attempt to remove a patient suffering from a fracture of the spine, pelvis, or thigh, except in a recumbent position.

8. In all doubtful cases treat as a fracture.

SPECIAL FEATURES.

Fracture of the Skull.—A fracture of the upper part is usually caused by direct violence—for example, a blow on the head. A fracture of the base is caused by indirect violence, through a fall on the head, a fall on the feet or lower part of the spine, or a severe blow on the lower jaw. *If the upper part is fractured*, the signs are swelling, irregularity, and frequently insensibility, either immediate or coming on gradually. *If the base is fractured* in

sensibility may come on immediately, blood or fluid may issue from the ear channel, blood may escape from the nose, or it may pass down to the stomach, whence it may be vomited ; the fracture may involve the orbit, causing a blood-shot eye. Injury to the brain is the great danger attending a fracture of the cranium.

TREATMENT.

See "Concussion and Compression of the Brain," pages 160 and 161.

Fracture of the Lower Jaw.—Pain, loss of power (inability to speak and to move the jaw freely), irregularity of the teeth, crepitus and bleeding from the gum are the usual signs and symptoms.

TREATMENT.

1.—Place the palm of the hand below the injured bone and press it gently against the upper jaw.

2.—Apply the centre of a narrow bandage under the chin, carry both ends upwards and tie above the forehead.

3.—Apply the centre of a narrow bandage in front of the chin, carry both ends backwards and tie at the back of the neck (Fig. 32).

4.—Tie the ends of both bandages together.

5.—If patient shows any indication of being about to vomit, remove bandages immediately, turn head

to the sound side and support the jaw with the palm of the hand. Re-apply bandages when vomiting has completely ceased.

FIG. 32.

Fracture of the Spine.—The vertebral column may be broken either by direct or indirect violence. The fall of a heavy weight upon the back, and falling from a height on the back across a bar or upon an uneven surface are examples of direct violence; and a fall on the head, causing a broken neck, is an example of indirect violence. What is commonly regarded as a broken back consists of a

fracture of one or more of the vertebræ with displacement of the fragments, whereby the spinal cord and the nerves issuing from it may be injured, causing complete or partial loss of power and sensation (paralysis) in all parts of the body below the seat of fracture. Pain is present at the seat of injury.

Treatment.

1.—If the patient is conscious immediately warn him to lie still.

2.—Cover the patient warmly.

3.—Bandage thighs, knees, legs, ankles and feet together.

4.—If the patient is found lying in any position except on the back, with great care and with all the assistance possible, slowly and evenly roll him on to his back; and, if the patient is unconscious, turn his head to one side.

5.—Send for a doctor.

If medical aid is not readily available, remove the patient to shelter as follows:—

1.—Lay a blanket or rug folded smoothly on a shutter, door or board of at least the same length and width as the patient. Failing this, the entire bed of a stretcher must be boarded (stiffened with a series of short transverse boards).

2.—Without moving the patient, and by utilising

the natural hollows of the body under the neck, loins and knees, pass broad bandages under (*a*) the head, (*b*) shoulder-blades, (*c*) buttocks, (*d*) thighs, and (*e*) calves ; working them into position without jerking.

3.—Tie the free ends of the bandages on each side to a long pole, pitch-fork handle, etc.

4.—Place the patient on the stretcher as follows :—

(*a*) *If five bearers are available*, two should stand on each side of the patient facing one another, and, on the word of command being given, grasp the poles firmly, with hands well apart, and slowly and evenly raise the patient sufficiently high to enable the fifth bearer to push the stretcher under.

(*b*) *If only four bearers are available*, they should lift the patient as in (*a*) above, and then move with short side paces till the patient is directly over the stretcher, care having been taken to place the foot of the stretcher as close to the head of the patient as convenient before proceeding to lift.

(*c*) *If only three bearers are available*, two should stand facing one another on either side of the patient. On the word of command being given, they stoop down and grasp the poles firmly, the hands well apart, opposite shoulders and hips, the

third bearer supporting the lower limbs. They then slowly and evenly raise the patient and move with short side paces till the patient is directly over the stretcher, care having been taken to place the foot of the stretcher as close to the head of the patient as convenient before proceeding to lift.

5.—On arrival at shelter nothing further is to be attempted until the arrival of a doctor, except to give the patient water, tea, etc., if he is conscious.

Fractured Ribs.—The ribs usually fractured are the sixth, seventh, eighth, or ninth, and generally the fracture is midway between the breast-bone and the spine. The fracture may be caused by indirect violence, driving the fractured ends of the bone outwards, or by direct violence, driving the fractured ends of the bone inwards and sometimes injuring the lungs or other internal organ. If the lower ribs on the right side are broken, the liver may be injured, and a fracture of the lower left ribs may wound the spleen. Evidence of the fracture is afforded by a sharp cutting pain, especially on attempting to take a deep breath, and by short and shallow breathing. If the lungs are injured blood, frothy and bright red, may be coughed up and expectorated. If the liver or spleen is wounded hæmorrhage may occur internally (see page 123).

Treatment.

(a) When the fracture is not complicated by an injury to an internal organ :—

1.—Apply two broad bandages round the chest firmly enough to afford support, with the centre of the first immediately above and that of the second immediately below the fracture. The lower bandage should overlap the upper to half its extent. The knots are to be tied rather to the front on the opposite side of the body. Another good plan is to apply a strong towel, folded about eight inches wide, firmly round the chest, securing it with three or four safety pins.

Fig. 33.

2.—Place the arm on the injured side in a large sling (Fig. 33).

(*b*) *When an internal organ is injured :—*

1.—Do not apply bandages round the chest.

2.—Lay the patient down with his body inclined toward the injured side, and supported there.

3.—Loosen the clothing, give ice to suck, and place an ice bag over the seat of injury. Treat as for hæmorrhage from an internal organ (see page 121).

4.—Place the arm on the injured side in a large sling.

Fracture of the Breast-bone.—When this fracture can be felt or is suspected, undo all tight clothing and keep the patient quiet in an easy position until the arrival of a doctor.

Fracture of the Collar-bone.—This fracture is frequently caused by a fall on the hand or shoulder. The arm on the injured side is partially helpless, and the patient usually supports it at the elbow with his hand, and inclines his head towards the injured side. The fractured ends can generally be felt to overlap, the outer fragment being the lower. The general signs and symptoms of fracture are present.

Treatment.

1.—Remove the coat and as much more of the clothing as is expedient. Unfasten a man's brace on the injured side.

2.—Place in the armpit a pad about two inches thick and four inches across.

3.—Gently raise the forearm well up, keeping the shoulder as far back as practicable, and support it in a St. John sling (see Figs. 10, 11 and 12).

Fig. 34.

4.—Secure the injured limb firmly to the side by a broad bandage passed round the elbow and trunk, so as to lever out the shoulder, the pad forming the fulcrum (Fig. 34).

5.—Ascertain that the pulse is present at the wrist; if it is not, relax the bandage around the body.

6.—Tighten the sling.

Fracture of the Shoulder-blade is very rare.

TREATMENT.

Apply the centre of a broad bandage in the armpit of the injured side, cross the ends over the uninjured shoulder and tie them under the armpit (Fig. 35). Support the injured limb in a St. John sling.

FIG. 35.

Fracture of the Arm.—The bone may be broken :—(*a*) close to the shoulder; (*b*) near the middle of the shaft; (*c*) close to or involving the elbow-joint.

TREATMENT.

(*a*) *When the Fracture is close to the Shoulder*—

1.—Apply a broad bandage with its centre above the middle of the arm round the limb and body, tying it on the opposite side.

2.—Support the wrist by a small arm sling.

(*b*) *When the Fracture is near the Middle of the Shaft*—

1.—Place the forearm at a right angle to the arm.

2.—Support the wrist by a small arm sling.

3.—Apply splints, reaching from the shoulder to the elbow on the front, back and outer side of the arm.

Fig. 36.

4.—Secure the splints by bandages above and below the fracture (Fig. 36). If splints are not available, secure the arm to the side by two broad bandages.

(*c*) *When the fracture, whether of the arm or forearm, involves the elbow-joint.*—These fractures are attended with much swelling, and it is difficult to ascertain the exact nature of the injury.

(i) *If the accident occurs indoors.*

1.—Lay the limb on a pillow in the most comfortable position.

2.—Apply ice or cold water dressings to the injured part.

3.—No further treatment should be attempted pending the arrival of a doctor.

(ii) *If the accident occurs out of doors—*

1.—Take two pieces of thin flat wood, one long enough to reach from the armpit to below the elbow, the other long enough to reach from beyond the elbow to the finger tips; tie them together to form a right angle (Fig. 37).

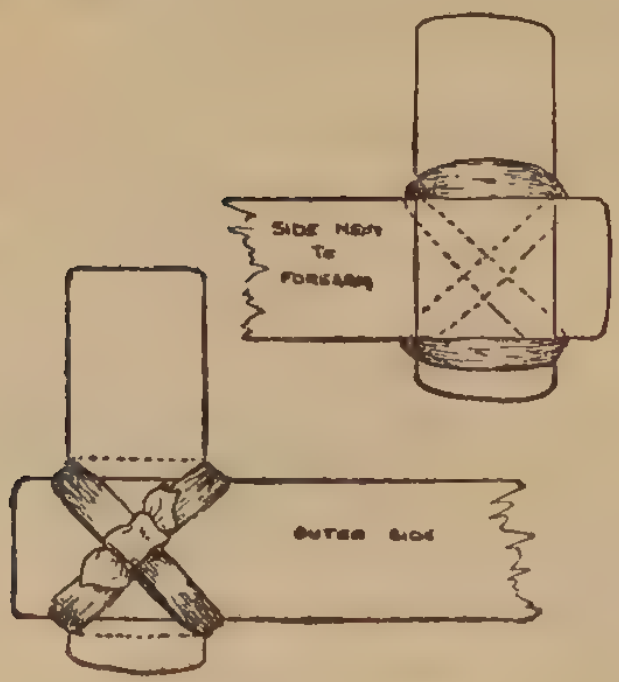


FIG. 37.

2.—Apply the angular splint so made on the side of the flexed limb that shows the least injury.

3.—Secure by bandages round the arm, the forearm and the hand.

4.—Support the limb by a small arm sling.

5.—On arrival at home remove the splint, and treat the injury as if it had occurred indoors.

Fracture of the Forearm.—When both bones are broken, the general signs and symptoms of fracture are usually present. When one of the bones only is broken the signs and symptoms are as a rule pain, loss of power, swelling, and irregularity.

An impacted fracture of the Radius just above the wrist is a common result of a fall on the hand.

Treatment.

This is the same, whether the fracture is of one bone or of both.

1.—Place the forearm at right angles to the arm, keeping the thumb upwards, and the palm of the hand towards the body.

2.—Apply splints on the inner and outer sides from the elbow to the fingers.

3.—Apply bandages, embracing both splints, one immediately above the fracture and the other as a figure of 8 round the wrist and hand (Fig. 38).

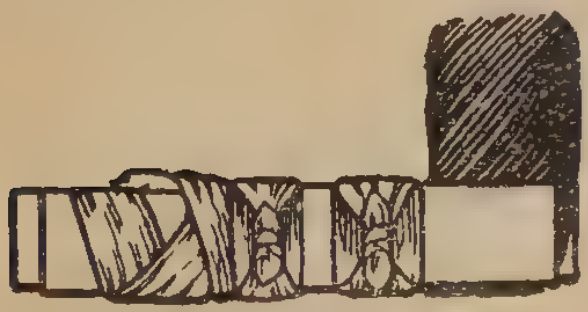


Fig. 38.

Fig. 39.

4.—Apply a large arm sling.

Crushed Hand—fracture of bones of the hand.

Treatment.

1. Apply a carefully padded splint to the front of

the hand, reaching from middle of forearm to beyond the tips of the fingers.

2.—To secure the splint apply a narrow bandage crossed in the manner of the figure 8, to the hand, wrist and forearm (Fig. 39).

3.—Apply a large arm sling.

Fracture of the Pelvis.—When, after a severe injury in the neighbourhood of the haunch-bones there is no sign of damage to the lower limbs, but the patient is unable to stand or even to move the lower limbs without great difficulty and pain, a fracture of the pelvis may be assumed to have occurred. The blood-vessels and organs, especially the bladder, within the pelvis are in danger of being injured.

Treatment.

1.—Lay the patient in whatever position is found to give the greatest ease, and flex or straighten the lower limbs as the patient desires.

2.—Apply a broad bandage round the hips tight enough to support the parts, but not so tight as to press the broken bone further inwards.

3.—Bandage both knees and ankles together.

Fracture of the Thigh-bone.—The thigh-bone may be broken at its neck, anywhere in the shaft or close to the knee. A fracture at the neck is,

likely to occur in old people from very slight injury, and is often difficult to distinguish from a severe bruise of the hip, but it may be assumed that when, after an injury near the hip-joint, the patient cannot, when lying on the back, raise the heel from the ground, the bone is broken. All the general signs and symptoms of fracture are usually present and a prominent sign is the position of the foot, which lies on its outer side. Shortening may vary from one-half to three inches.

Treatment.

1.—Steady the limb by holding the ankle and foot.

2.—Gently draw down the foot, bring it into line with its fellow, and tie the feet firmly together (bandage A in Fig. 40).

3.—Pass seven bandages under the patient in the following order :—

The chest, just below the armpits (B).
The pelvis, in line with the hip joints (C).
Both ankles (D). This covers bandage A.
Both thighs, above the fracture (E).
Both thighs, below the fracture (F).
Both legs (G).
Both knees (H) (*a broad bandage*).

4.—Place a splint along the injured side of the patient from the armpit to just beyond the foot.

FIG. 40.

5.—Secure the splint by tying the bandages in the same order. All the bandages should be tied over the splint except D, which should be applied as a figure of 8 and tied below the feet.

FIG. 41.

Fracture of the Knee-cap.—The knee-cap may be broken by direct violence, but more frequently it is broken by muscular action, as follows:—When the foot slips, in the attempt to prevent a fall, the muscles in the front of the thigh act with such force as to snap the knee-cap in two (Fig. 41).

Pain, loss of power (the limb will be quite helpless), irregularity (a gap may be felt between the broken fragments of bone) and swelling accompany this injury.

Treatment.

1.—Lay the patient on his back, raise well and support the head and shoulders, straighten and raise the limb.

Fig. 42.

2.—Apply a splint along the back of the limb, reaching from the buttock to the heel.

3.—Secure the splint by bandages round the thigh and leg.

4.—Support the foot well off the ground by a pillow, roll of clothing, two bricks, etc.

5.—Apply a narrow bandage with its centre immediately above the knee-cap, cross the ends behind over the splint, pass them again to the front of the limb just below the knee-cap and tie them (Fig. 42).

6.—Apply cold (ice or cold water) dressings over the fracture to lessen swelling of the joint.

Fracture of the Leg.—One or both of the bones may be broken. When both bones are broken all the general signs of fracture are usually present, but when one bone only is broken deformity is not always noticeable. A fracture of the fibula three or four inches above its lower end is frequently mistaken for a sprain and sometimes for a dislocation of the ankle.

Treatment.

1.—Steady the limb by holding the ankle and foot.

2.—Draw the foot into its natural position, and do not let go until the splints have been fixed.

3.—Apply splints on the outer and inner sides of the leg, reaching from above the knee to beyond the foot. If only one splint is available place it on the outer side.

4.—Secure the splints by bandages (A) above, (B) below the fracture, (C) immediately above the knee, (D) round both ankles, (E) a broad bandage round both knees (Fig. 43).

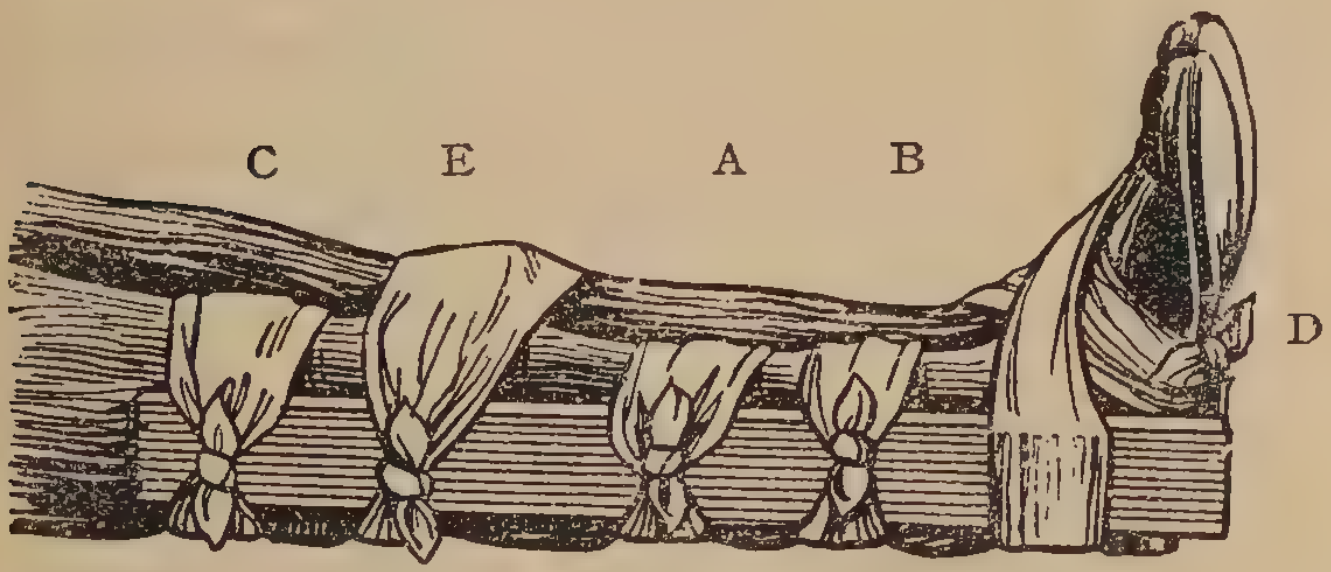


Fig. 43.

When single-handed, after extending the limb tie both feet together, dispense with the inner splint, and pass the bandages round both limbs in the order shown in Fig. 43.

When no splint is available the ankles, knees and thighs should be tied together.

Crushed Foot.—Fracture of bones of the foot.—This injury is commonly caused by the passage

of a heavy weight over the foot, and may be recognised by pain, swelling, and loss of power.

TREATMENT.

FIG. 44.

1.—Remove the boot and stocking.

2.—Apply a well-padded splint to the sole of the foot, reaching from the heel to the toes.

3.—The centre of a narrow bandage being placed over the instep, apply it crossed after the manner of the figure 8 (Fig. 44).

4.—Support the foot in a slightly raised position.

QUESTIONS ON CHAPTER IV.

The numerals indicate the pages where the answers may be found.

	PAGE
What is a fracture ?	53
What are the causes of fracture ?	53
Where does a bone break when direct violence is the cause of fracture ?	53
Where does a bone break when indirect violence is the cause of fracture ?	53
How may a fracture be caused by muscular action ?	53
In what two ways may fractures be classified ? ..	53
What is a simple fracture ?	53
What is a compound fracture ?	54
What is a complicated fracture ?	54
What is a comminuted fracture ?	54
What is a green-stick fracture ?	54
What is an impacted fracture ?	54
State the general signs and symptoms that may be present in a case of fracture	55
In making up your mind whether a fracture had occurred or not, what points should you take into consideration beyond the signs and symptoms ?	55
What is the object of first aid treatment of fractures ?	56
What apparatus may be necessary for the treatment of fractures ?	56
Give the general rules for the treatment of fractures	56
How should splints be applied ?	57
How may splints be improvised ?	57

PAGE

How should bandages be applied ? 58
What may cause a fracture of the upper part of the cranium ? 59
What may cause a fracture of the base of the cranium ? 59
What are the signs of fracture of the upper part of the cranium ? 59
What are the signs of fracture of the base of the cranium ? 60
What is the treatment for fracture of the cranium ? 60
What are the signs, symptoms and treatment of fracture of the lower jaw ? 60
How may a fracture of the spine be caused ? .. 61
What is commonly regarded as a broken back ? .. 61
What are the signs and symptoms of a fractured spine ? 62
What is the treatment for a fracture of the spine ? 62
How would you remove to shelter a patient with a fracture of the spine ? 62
How may ribs be fractured ? 64
How may a fracture of ribs be complicated ? .. 64
State the signs, symptoms and treatment of a simple and of a complicated fracture of the ribs 64
What is a frequent cause of fractured collar-bone ? 66
What are the signs, symptoms and treatment of fractured collar-bone ? 66
At what points may the bone of the arm be broken ? 68
Are the general signs and symptoms of a fracture always present in a broken forearm ? 70
State the treatment for a fracture of the forearm .. 71
State the treatment for a crushed hand 71
State the cause of a common fracture of the radius 71
How would you recognise a fracture of the pelvis ? 72

PAGE

State the treatment for a fracture of the pelvis .. 72
At what points may the thigh-bone be broken ?.. 72
What are the signs, symptoms and treatment of fracture of the thigh-bone ? 73
What are the causes of fracture of the knee-cap ? .. 74
What are the signs, symptoms and treatment of fracture of the knee-cap ? 75
Are the general signs and symptoms always present in a fracture of the leg ? 76
State the treatment for a fracture of the leg .. 76
What mistake may easily be made when the fibula is broken near its lower end ? 76
State the treatment for a crushed foot 78

Practice

Skull, 59. Lower Jaw, 60. Spine, 61. Ribs, 64. Breast-bone, 66. Collar-bone, 66. Shoulder-blade, 68. Arm, 69. Forearm, 70. Crushed hand, 71. Pelvis, 72. Thigh-bone, 72. Knee-cap, 74. Leg, 76. Crushed foot, 77.

Chapter V.

INJURIES TO JOINTS AND MUSCLES.

DISLOCATIONS.

A dislocation is the displacement of one or more of the bones at a joint.

The joints most frequently dislocated are those of the shoulder, elbow, thumb, fingers, and lower jaw.

Signs and Symptoms.

1.—Pain of a severe sickening character at or near the joint.

2.—Loss of power in the limb.

3.—Fixity of the joint.—The limb cannot be moved at the joint either by the patient or others.

4.—Deformity of the limb.—The limb assumes an unnatural position, and is mis-shapen at the joint.

5.—Swelling about the joint.

6.—Numbness of the parts below the seat of dislocation.

Treatment.

Make no attempt to reduce a dislocation.

(*a*) *When the accident occurs out of doors*—

Support the limb in the position which gives most ease to the patient, bearing in mind

the necessity of lessening the effects of jolting during transport.

(*b*) *When the patient is indoors; or after reaching shelter*—

1.—Rest the patient on a couch or bed in the position which gives most ease.

2.—If the pain is severe, expose the injured part and apply cold (ice or cold water) dressings frequently.

3.—When cold ceases to give comfort apply warmth (flannels or towels wrung out of hot water).

4.—Treat shock (see page 161).

SPRAINS.

When, by a sudden wrench or twist, *the ligaments and the parts around a joint* are stretched or torn the joint is said to be sprained.

Signs and Symptoms.

1.—Pain at the joint.

2.—Inability to use the joint without increasing the pain.

3.—Swelling and discoloration.

Treatment.

1.—Support the limb in the most comfortable position (usually well raised).

2.—Apply cold (ice or cold water) dressings to the joint.

3.—When cold fails to give relief, apply warmth (flannels or towels wrung out of hot water).

In the case of a sprained ankle :—

When out of doors—

1.—Apply a bandage tightly over the boot placing its centre on the sole under the instep, crossing it on the front of the ankle, and carrying it round and round the ankle, where it is to be firmly tied.

2.—Wet the bandage after application ; it is thereby tightened.

When the patient is indoors ; or after reaching shelter—

Remove the boot and stocking and treat as above.

STRAINS AND RUPTURED MUSCLES.

When, during severe exertion, *muscles or tendons* are over-stretched they are said to be strained ; or, if they are actually torn, they are described as ruptured.

A so-called strain in the groin (hernia) is an injury of a totally different nature (see page 125).

Signs and Symptoms.

1.—A sudden sharp pain at the seat of injury.

2.—When the muscles of a limb are strained they may swell and cause severe cramp.

3.—Further exertion is difficult or impossible; for example, if the strain has occurred in the back the patient may be unable to stand upright.

Treatment.

1.—Place the patient in the most comfortable position, and afford support to the injured part.

2.—Apply warmth (flannels or towels wrung out of hot water).

QUESTIONS ON CHAPTER V.

The numerals indicate the pages where the answers may be found.

	PAGE
What is a dislocation?	82
State the signs and symptoms of dislocation ..	82
State the treatment of dislocation	82
What is a sprain?	83
What are the signs, symptoms and treatment of a sprain?	83
State the treatment of a sprained ankle	84
How may muscles be strained or ruptured? .	84
State the signs and symptoms of strains	85
State the treatment of strains	85

Chapter VI.

THE CIRCULATION OF THE BLOOD.

The organs concerned in the circulation of the blood are the **Heart**, the **Arteries**, the **Capillaries** and the **Veins**.

The Heart is a muscular organ which acts like a pump. It is situated in the chest behind the breast-bone and rib cartilages, between the lungs and immediately above the diaphragm; it lies obliquely with a quarter of its bulk to the right, and the remaining three-quarters to the left of the middle line of the body. Its beat may be felt just below and to the inner side of the left nipple. The heart has four cavities, two on either side of a central partition. The two upper cavities are named the **right and left auricles**, the two lower the **right and left ventricles**.

The heart contracts in adults at an average rate of seventy-two times a minute, but the rate increases as the position is changed from the lying to the sitting, and, still more, to the standing position; hence the importance of considering the patient's position in cases of bleeding. At every contraction of the left ventricle blood is forced into the **arteries**,

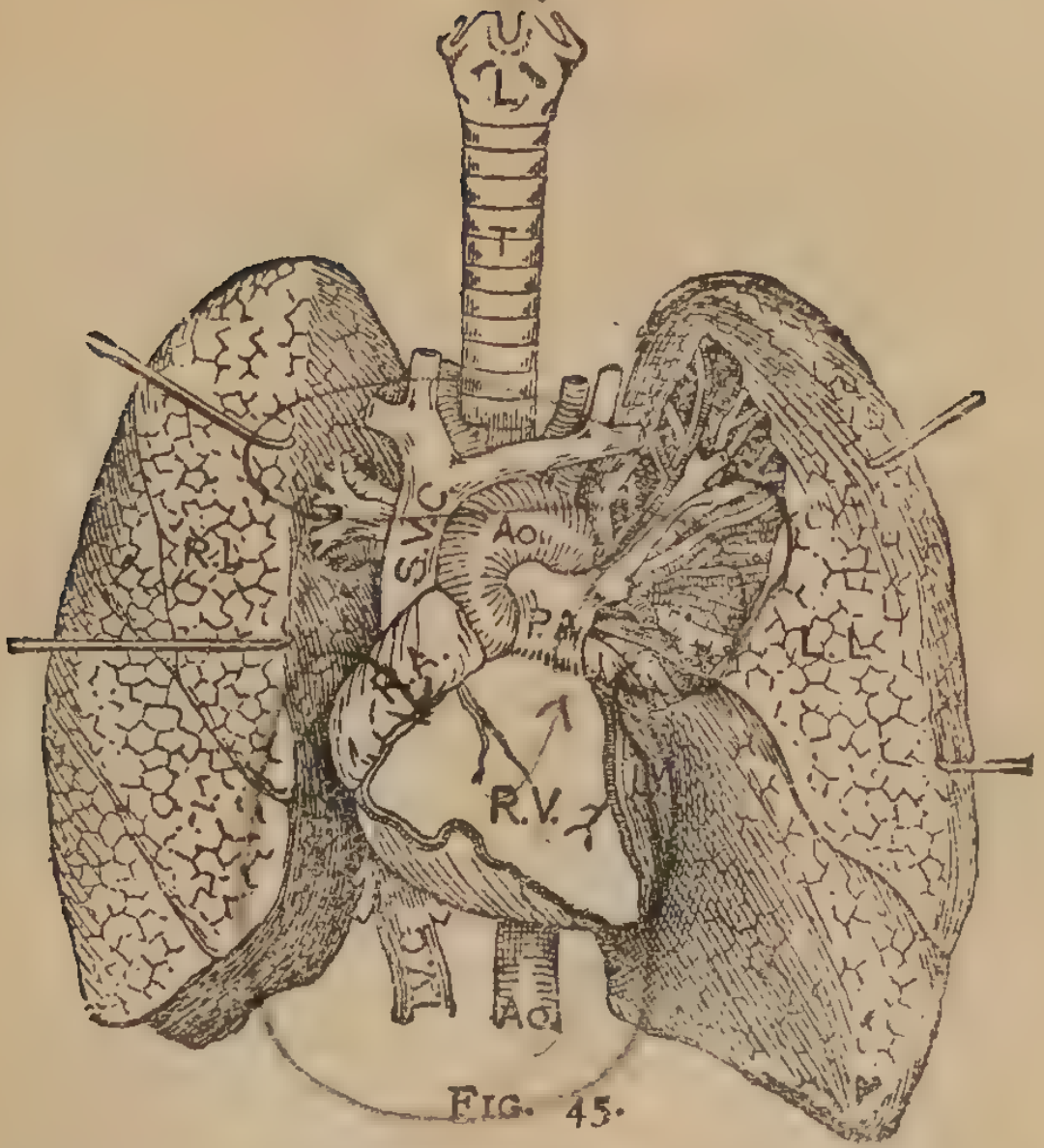


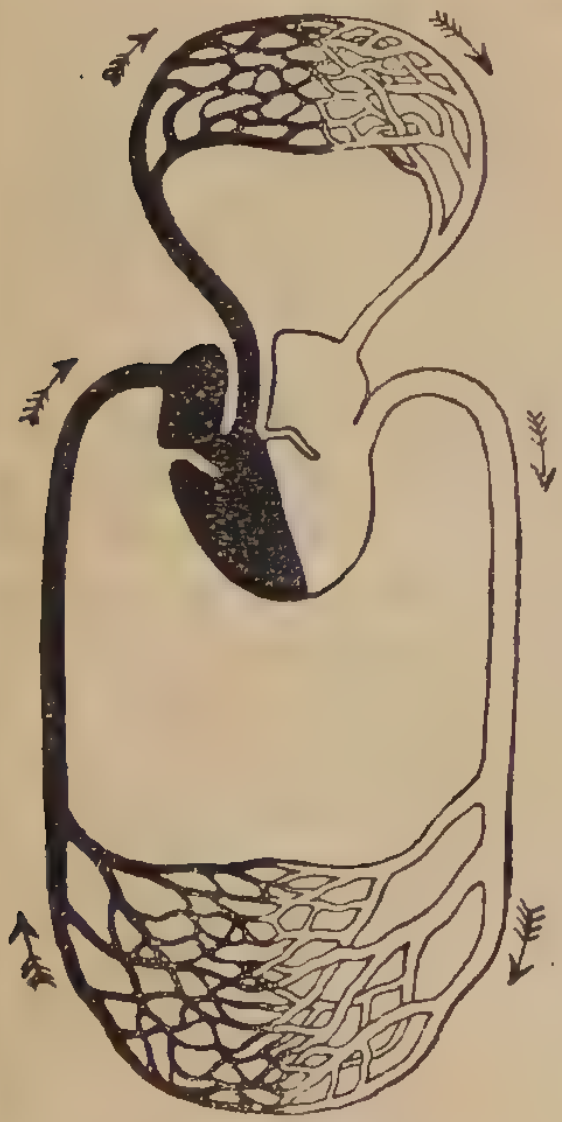
FIG. 45.

L. Larynx (voice box) ; T. Trachea (wind pipe) ; R.L. Right Lung ; L.L. Left Lung (the lungs are drawn back to expose the heart and blood vessels) ; R.A. Right Auricle ; L.A. Left Auricle ; R.V. Right Ventricle ; L.V. Left Ventricle ; P.A. Pulmonary Artery ; Ao. Aorta ; S.V.C. Superior vena cava (the large vein carrying blood from the upper part of the body to the heart) ; I.V.C. Inferior vena cava (the large vein carrying blood from the lower part of the body to the heart). The four pulmonary veins cannot be shown in the diagram.

which have a large amount of elastic tissue in their walls, and causes them to dilate, producing the regular expansion known as the **pulse**, which, corresponding with each beat of the heart, may be felt wherever the finger can be placed on an artery as it lies superficially over a bone.

In the general (systemic) circulation the purified bright red blood in the left ventricle of the heart is driven into the main artery of the body (Aorta). From the aorta, branch arteries are given off to all parts of the body. The blood is propelled forward by the force of the contractions of the heart, and by the recoil of the elastic walls of the arteries, which have been dilated by the blood at each beat of the heart. These arteries divide and sub-divide, becoming smaller and smaller, and terminate in very thin walled vessels (**capillaries**). Through these thin walls of the capillaries, an interchange of gases and fluids takes place. The blood gives off oxygen gas and nourishment to the tissues and organs of the body, and takes up from them carbonic acid gas and waste matters. The presence of these impurities changes the colour of the blood from bright to dark red. The capillaries unite to form small **veins**, and these join with other veins, becoming larger and larger until they have all united to form two large veins (Venæ Cavæ), which enter the right auricle of

the heart. The blood is helped onwards in the veins by the suction action of the heart, which dilates



Explanation.—In the middle of the diagram is the heart with its four chambers. Above the heart is shown the lung (pulmonary) circulation. The lower part represents the general (systemic) circulation. Vessels containing impure (venous) blood are shown black, while those containing pure (arterial) blood are shown white. The connecting vessels represent the capillaries. The arrows show the direction of the flow of blood.

FIG. 46.
DIAGRAM OF THE CIRCULATION OF THE BLOOD.

after being emptied at each contraction. The veins are provided at frequent intervals with valves, which

allow the blood to flow forward and close to prevent any backward flow.

From the right auricle of the heart the blood passes into the right ventricle; and the contraction of the ventricle forces it into the **Pulmonary Artery**, which carries it to the lungs. This artery also divides into capillaries in the lungs so that the blood comes into contact with the air. Here it gives off its carbonic acid gas and impurities and takes up oxygen, thus becoming purified and bright red in colour. The capillaries unite to form the pulmonary veins which convey the blood to the left auricle of the heart, whence it passes to the left ventricle, and so completes the round of the circulation.

QUESTIONS ON CHAPTER VI.

The numerals indicate the pages where the answers may be found.

	PAGE
What organs are concerned in the circulation of the blood?	86
Describe the heart	86
How many times a minute does the heart contract on the average?	86
What is the effect of the patient's position on the rate at which the heart contracts?	86
What is the pulse?	88
Describe the circulation of the blood	88

Chapter VII.

WOUNDS AND HÆMORRHAGE.

Wounds may be classified as follows :—

1.—Incised wounds which are caused by a sharp instrument, such as a razor, and bleed freely, as the blood vessels are " clean cut."

2.—Lacerated wounds which have torn and irregular edges. They are caused by such things as machinery, a piece of shell or the claws of an animal. As the blood vessels are torn through these bleed less freely than incised wounds, and the bleeding may be delayed for a time.

3.—Contused wounds which are accompanied by bruising of the tissues, and are caused by a direct blow by some blunt instrument or by crushing.

4.—Punctured wounds which have comparatively small openings, but may be very deep and are caused by a stab from any sharp-pointed instrument, as a needle, knife or bayonet.

Gun-shot wounds come under one or more of the above headings.

Hæmorrhage, or bleeding, is of three kinds :—

1. Arterial. 2. Capillary. 3. Venous.

Arterial Hæmorrhage.

1.—Blood from an artery is bright red.

2.—**If the wounded artery is near the skin the blood spurts out in jets** corresponding to the pulsation of the heart.

3.—It issues from the side of the wound nearer to the heart.

Capillary Hæmorrhage.

1.—The blood is red.

2.—It may flow briskly in a continuous stream or merely ooze from all parts of the wound.

Venous Hæmorrhage.

1.—Blood from a vein is dark red.

2.—It flows in a steady, continuous stream.

3.—It issues from the side of the wound further from the heart.

Treatment of Wounds.

The objects of First Aid treatment of wounds are :—

1.—To stop the bleeding. As a clot of blood is Nature's method of stopping bleeding, it should never be disturbed when present over a wound. A blood clot serves the double purpose of keeping blood in and germs out.

2.—To lessen the effects of shock (see p. 161).

3.—To prevent contamination (sepsis) by the entrance of minute living organisms called germs, which are present in the air, in water, and on all surrounding objects, such as the hands, clothes, etc. It is very easy to introduce germs into a wound, however small :—

(*a*) By touching it, unless the hands are perfectly clean and have been rendered sterile by painting them with tincture of iodine or rubbing them with methylated or other spirit.

(*b*) By washing it with water which has not been previously sterilised, that is, boiled and allowed to cool.

(*c*) By leaving it exposed to the air.

(*d*) By the application of sticking plaster or ointment.

General Rules for Treatment of a Wound accompanied by Arterial Hæmorrhage.

1.—Place the patient in a suitable position, bearing in mind that blood escapes with less force when the patient sits, and still less when he lies down.

2.—Except in the case of a fractured limb, elevate the bleeding part, as thereby less blood finds its way into it.

3.—Expose the wound, removing whatever clothing may be necessary.

4.—Immediately apply pressure with the thumb or fingers directly on the bleeding spot (direct digital pressure). Direct pressure must not be made over a fracture or foreign body.

5.—If the wound is large, or if a foreign body or a fracture is suspected, **apply pressure with the thumb or fingers on the pressure point** (see numbered dots on Frontispiece) next to the wound on the heart side (indirect digital pressure). When making digital pressure avoid crooking the thumb or fingers and digging the tips into the part. The nearest pressure point is chosen in order to avoid cutting off the circulation from as much of the part as possible, but sometimes it is necessary to apply pressure still nearer to the heart.

6.—Maintain indirect pressure by a tourniquet or pad and bandage on the pressure point while the wound is being examined and treated.

To improvise and apply a tourniquet :—

(*a*) Apply a firm pad on the pressure point.

(*b*) Encircle the limb by a narrow bandage or strap with its centre over the pad, and tie the ends in a half knot on the opposite side.

(*c*) Lay a short, strong stick or other similar

object on the half knot, and over it tie a reef knot.

(*d*) Twist the stick to tighten the bandage, thereby pressing the pad upon the artery, and arresting the flow of blood.

(*e*) Lock the stick in position by the ends of the bandage already applied, or by another bandage passed round the stick and limb.

The pad of the tourniquet must be accurately placed upon the pressure point so as completely to compress the artery ; otherwise arterial blood will be allowed to pass along the limb, and the veins, being compressed by the tourniquet, will not allow the blood to return through them to the heart, and the result will be dangerous swelling and congestion.

Should a suitable pad not be at hand, a knot may be made in the centre of the bandage, and when available, a stone, cork, etc., enclosed in it to give it firmness and bulk. See that the bulging and not the flat side of the knot is on the pressure point.

The use of elastic bandages, except when part of a limb is cut or torn off, is to be rigorously avoided, as it stops the return flow of blood through the veins.

7.—Remove foreign bodies, such as broken glass, bits of clothing, hair, etc., seen in the wound ; do not search for foreign bodies which cannot be seen.

8.—**If the wound is obviously dirty, and surgical aid cannot be procured at once, wash away as much of the dirt as possible** by gently pouring sterilised water over it freely, notwithstanding the fact that wounds heal best if kept dry. **Never wash the surrounding parts towards a wound.**

9.—**Apply tincture of iodine all over the wound and the surrounding skin, and cover with a clean, dry, soft and absorbent dressing,** such as sterile gauze or lint, boracic lint, a perfectly clean handkerchief or piece of linen. Clean unprinted paper, such as the inside of an envelope, may be used in emergency.

10.—Cover the dressing with a pad of wool, lint or other soft material.

11.—Apply a bandage over the pad firmly; but if the presence of a foreign body or fracture is suspected apply it lightly.

12.—When, in accordance with Rules 10 and 11, a pad and bandage have been applied, relax indirect pressure, but not direct pressure, and note whether bleeding has been stopped by the direct method. If it has, leave the relaxed tourniquet in position; if it has not, again tighten the tourniquet. As prolonged maintenance of a tourniquet may cause dangerous congestion in the limb, prompt steps to obtain medical help are extremely

necessary. If it is not obtainable within half an hour, at the end of that time, or sooner if the tourniquet is causing much pain, again relax indirect pressure and note whether bleeding recurs. If necessary, re-apply indirect pressure, and repeat these steps at intervals of half an hour until medical help is obtained.

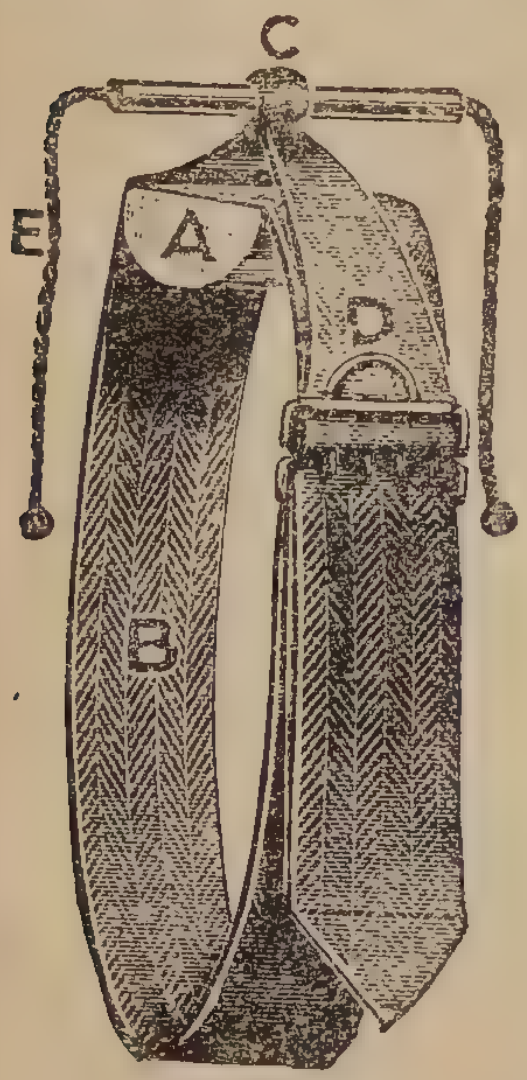


FIG. 47.

13.—Afford support to the injured part.

14.—Treat shock (see page 161).

Students practising arrest of arterial hæmorrhage in the limbs or neck should feel the pulse of the radial, posterior tibial, or temporal artery, as the case may be, to note when the flow of blood in the artery stops, and should then immediately relax the pressure made on the artery. In this way the importance of the accurate application of pressure will be realised, and the amount of force necessary will be ascertained.

A very useful form of tourniquet is known as the "St. John" (Fig. 47), which consists of a piece of webbing two inches wide (B), provided with a buckle (D), pad (A) and twister (C) over the pad. First place the pad on the pressure point, pass the band round the limb and, both while and after buckling firmly, ensure that the pad is in correct position; then apply sufficient pressure with the twister to arrest hæmorrhage, keeping the twister as near the centre of the pad as possible. Finally secure the twister by the string (E) passing through it, which should be tied to the D of the buckle, or may be temporarily secured by passing it between the strap and the part of the buckle on which the spikes rest.

THE COURSE OF THE MAIN ARTERIES, AND THE ARREST OF ARTERIAL HÆMORRHAGE.

(The numbers of the pressure points in the text refer to those on the Frontispiece.)

The Large Arteries Within the Chest and Abdomen.

The Aorta is the central or trunk artery of the body. Commencing at the left ventricle, it forms an

arch behind the upper part of the breast-bone. From the arch are given off the large branches which carry the blood to either side of the head and neck and to the upper limbs. The Aorta passes down on the left of the spine to just below the navel, where it divides into two great branches (Iliacs) which convey the blood to the organs in the pelvis and to the lower limbs.

Arteries of the Head and Neck.

The Carotid Artery leaves the upper part of the chest and passes up on the side of the windpipe and, just below the level of the angle of the lower jaw, divides into the Internal and External Carotid Arteries. **The Internal Carotid Artery** ascends deeply in the neck, and enters the cranium to supply the brain with blood. **The External Carotid Artery** gives off three important branches, the arteries of the tongue (Lingual), of the face (Facial) and of the back of the head (Occipital); the artery itself is then continued upwards in front of the ear, to supply the scalp in the front half of the head (Temporal).

When a Carotid Artery is wounded, as in the case of a cut throat, apply the thumb of one hand on the artery at pressure point 1, pressing backwards against the spine and taking care to avoid the windpipe. It may also be necessary to apply pressure with the other thumb above the wound to arrest the flow of blood (*a*) from the main vein in the neck (Jugular), which runs alongside the carotid artery and is usually wounded at the same time; (*b*) from the upper end of the carotid artery itself, which is often considerable owing to communication between the branches of this artery and those of the corresponding one on the other side of the neck. Digital pressure must be maintained, by relays of assistants if necessary, until the doctor arrives (Fig. 48).

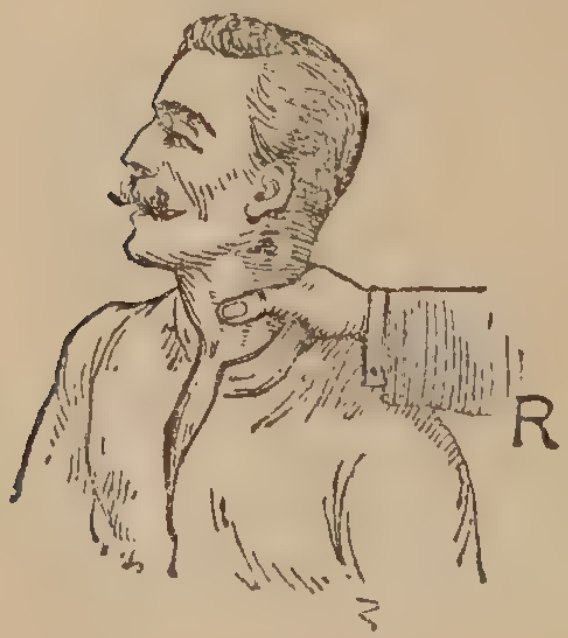


FIG. 48.

The Facial Artery crosses the edge of the lower jaw in a slight hollow two fingers' breadth in front of the angle, and sends branches to the chin, lips, cheek, and outside of the nose. Hæmorrhage from wounds

of the face below the level of the eye is to be arrested by :—

(*a*) Digital pressure on pressure point 2 (Fig. 49).

(*b*) Grasping the lips or cheek on both sides of the wound by the finger inside and the thumb outside the mouth or vice versa.

FIG. 49.

FIG. 50.

The Temporal Artery may be felt pulsating in front of the upper part of the ear. Hæmorrhage from the region of the temple may be arrested by pressure applied at pressure point 3 (Fig. 50).

The Occipital Artery supplies branches to the region of the scalp from behind the ear to the back of the head. Hæmorrhage from this region may be arrested by digital pressure on pressure point 4, four fingers' breadth behind the ear (Fig. 51). This point

FIG. 51.

FIG. 52.

is difficult to find, and it is usually sufficient to apply pressure immediately below the wound.

Hæmorrhage anywhere in the Scalp may be arrested by applying a small firm pad on the bleeding point and securing it by a narrow bandage with its centre laid on the pad, the ends carried round the

head in the direction most convenient, and tied tightly over the pad (Fig. 52).

When with a wound of the forehead or scalp a fracture is suspected, apply a ring pad around the seat of injury. To make a ring pad, pass one end of a narrow bandage round your fingers; pass the other end of the bandage through the ring thus formed and continue to pass it through and through until the whole of the bandage is used and a ring as shown in Fig. 53 is formed.

FIG. 53.

ARTERIES OF THE UPPER LIMBS.

The Subclavian Artery passes from a point behind the inner end of the collar-bone across the first rib to the armpit.

To apply digital pressure:—

1. Bare the neck and upper part of the chest.
2. —Place the patient's arm against the body so as to depress the shoulder; and cause him to incline his head towards the injured side.
3. Take your stand opposite the shoulder, facing the patient.

4.—Using the left hand for the right artery, and ***vice versa***, grasp the neck low down, placing the fingers behind the shoulder and the thumb immediately above and behind the collar-bone in the hollow between the muscles attached to the bone on pressure point 5.

FIG. 54.

5.—Press the thumb deeply downwards against the first rib, which is beneath the collar-bone at this spot (Fig. 54).

The Axillary Artery, which is a continuation of the Subclavian, keeps close under the shoulder joint, and can be felt pulsating when the fingers are deeply pressed into the armpit. Digital pressure is difficult to apply to this artery.

To apply a pad and bandage :—

1.—Place a hard pad (the size of a billiard ball) in the armpit at pressure point 6.

2.—Apply the centre of a narrow bandage on the

pad ; cross the bandage on the shoulders, pull the ends tight and tie them under the opposite armpit, taking care that the pad does not slip.

3.—Flex the forearm and tie the limb tightly to the trunk with a broad bandage, applied on a level with the elbow (Fig. 55).

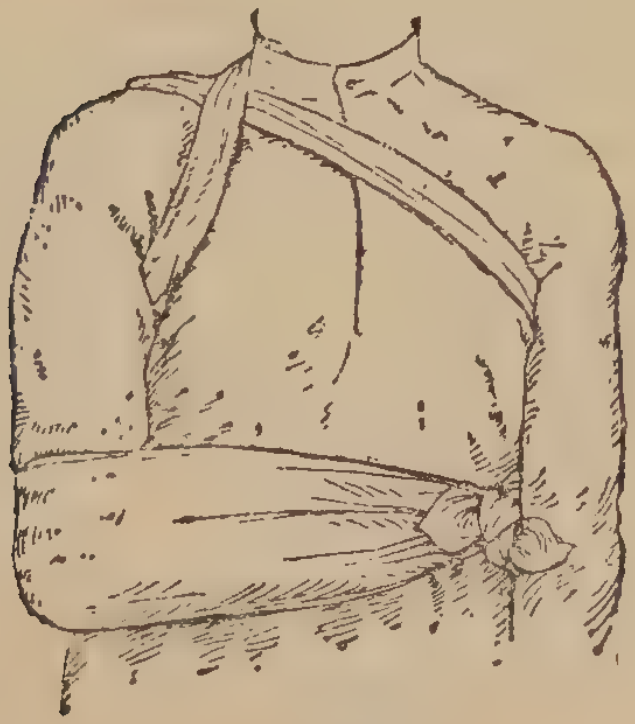


Fig. 55.

The Brachial Artery is a continuation of the Axillary, and runs down the arm under the inner side of the biceps muscle, gradually passing forward until it reaches the middle of the front of the elbow. The

inner seam of the coat above the elbow roughly indicates its course.

Digital pressure or a tourniquet is applied at pressure point 7 (Fig. 56).

In an urgent emergency and if there is no possibility of a fracture, the Brachial artery may, as a purely temporary measure, be compressed at the elbow by flexion over a fold of the sleeve.

Just below the elbow the Brachial artery divides into the **Radial and Ulnar arteries,** which run along

FIG. 56.

the front of the forearm on the outer and inner sides respectively. The pressure points (8 and 9) are about one inch above the wrist and about half an inch from the outer and inner sides of the forearm, where the arteries may be felt pulsating. These arteries join to form the **Palmar Arches** in the hand; branches run along on either side of each finger to the tips.

Pressure may be applied to the Radial and Ulnar

arteries at pressure points 8 and 9, by the thumbs (Fig. 57) or as follows :—

1.—Cut the cork of a quart or pint bottle in two lengthwise.

2.—Lay the rounded side of one half on the Radial, and of the other half on the Ulnar artery.

3.—Secure them by a tight bandage.

Fig. 57.

To arrest hæmorrhage from the palm of the hand when no foreign body or fracture is present or suspected :—

1.—Apply a firm pad, and make the patient grasp it firmly.

2.—Spread out a triangular bandage, turn up the base about four inches, lay the back of the patient's hand on the centre of the bandage, fold the point over the knuckles and wrist pass the two ends round the wrist, make the patient pull on the point of the bandage cross the ends over the fingers and thumb twice and tie them as firmly as possible.

Bring the point (A) down to the knuckles and fasten with a pin at B (Fig. 58).

3.—Elevate the forearm and support it with a St. John sling.

Arterial hæmorrhage from the fingers may be arrested by applying a small pad on the wound, and securing it firmly with a strip of tape, linen or plaster.

FIG. 58.

ARTERIES OF THE LOWER LIMBS.

The Femoral Artery, a continuation of the Iliac, may be felt pulsating immediately below the skin where it enters the thigh in the centre of the fold of the groin. (To find the groin, raise the limb so as to flex the thigh; the fold in the clothing at the top of the thigh will indicate the groin.) The course of the artery may be indicated by a line drawn from the centre of the groin to the inner side of the knee. After traversing two-thirds of this line, the Femoral artery passes behind the thigh bone to the back of the knee-joint as the **Popliteal artery.**

Digital pressure may be applied to the Femoral artery at the groin on pressure point 10 as follows :—

1.—Lay the patient on his back.

2.—Kneel beside the patient, facing his head.

3.—Flex the thigh slightly, and place the thumbs one on the other upon the pressure point, at the centre of the groin, grasping the thigh with the hands (Fig. 59).

4.—Press firmly against the brim of the pelvis.

FIG. 59.

When the Femoral artery is wounded in the upper third of its course, pressure must be maintained at the groin. No really satisfactory tourniquet has been devised for compression at this point, and relays of assistants should be employed to keep up

the pressure until the doctor arrives; each fresh assistant places his thumbs over those of his predecessor, who slips his away, and thus gushes of blood are prevented during the change.

Application of a tourniquet to the Femoral ar ery (pressure point 11) :—

When practising compression of this artery, it is a good plan to draw a chalk line from the centre of the groin to the inner side of the knee and place the pad of the tourniquet on this line as high up as the bandage can be applied (Fig. 60). The pad should be the size of a lawn tennis ball.

Just below and behind the knee-joint the Popliteal artery divides into the **Anterior** (front) and **Posterior** (back) **Tibial arteries.**

The Posterior Tibial Artery passes down the back of the leg to the inner side of the ankle. It is at first deeply placed between the muscles of the calf, but it approaches the surface as it proceeds, so that it can be felt pulsating behind the large bone at the inner side of the ankle. It enters the sole as the **Plantar Arteries,** which run forward amongst the muscles to supply the foot and toes.

The Anterior Tibial Artery, on leaving the Popliteal, at once passes forward between the leg bones, and, deeply placed amongst the muscles, runs down the leg to the centre of the front of the ankle.

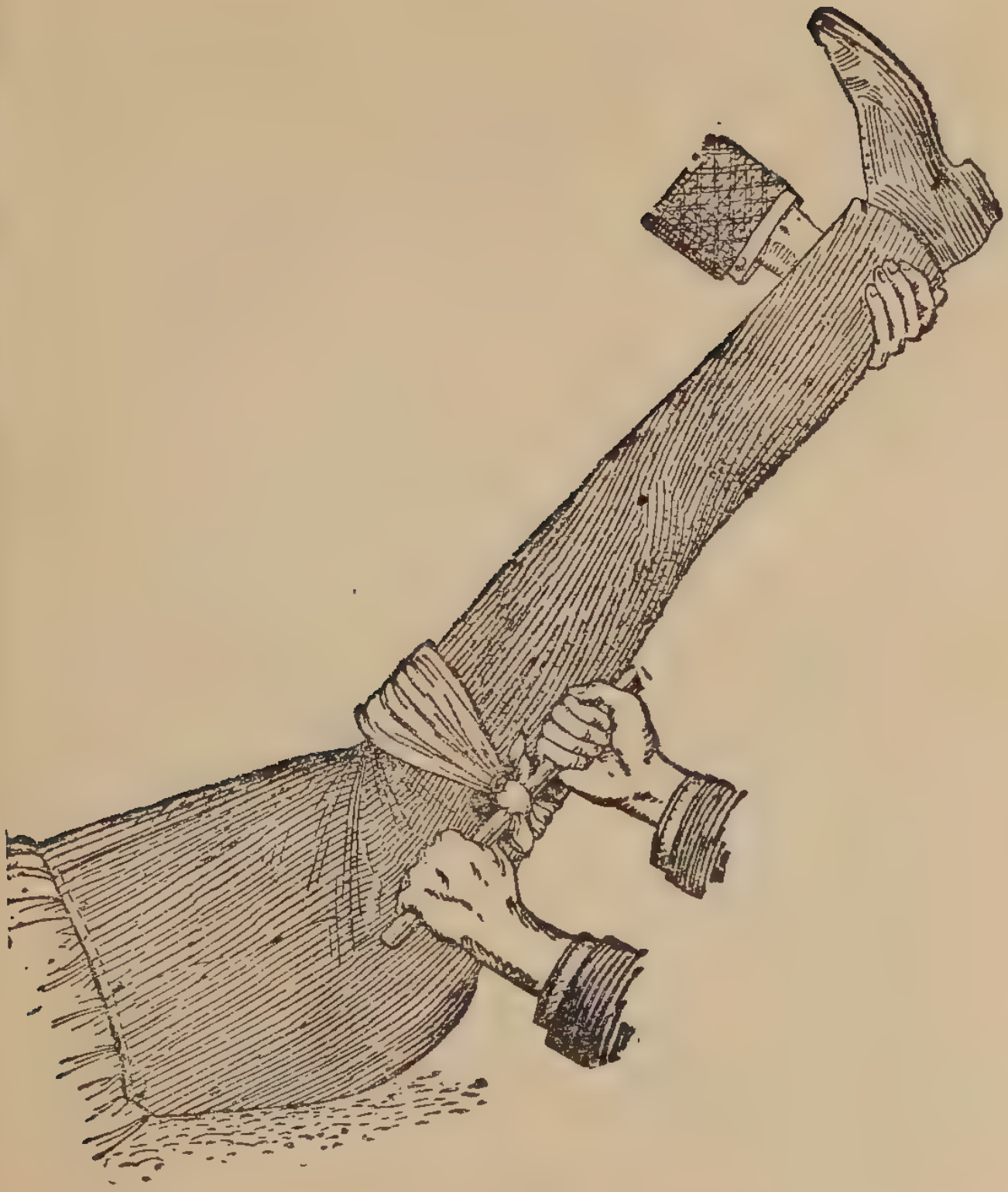


Fig. 60.

This artery is continued as the **Dorsal Artery of the Foot,** which, passing forward over the tarsus, dips down to the sole between the first and second metatarsal bones. Here it forms with the Plantar arteries what is known as the **Plantar Arch.**

At the ankle pressure may be applied by the fingers or by pads and bandages on pressure points 12 and 13.

General Rules for Treatment of a Wound accompanied by Capillary Hæmorrhage.

1.—Expose the wound, removing whatever clothing may be necessary.

2.—Remove foreign bodies, such as broken glass, bits of clothing, hair, etc., seen in the wound ; do not search for foreign bodies which cannot be seen.

3.—If the wound is obviously dirty, and surgical aid cannot be procured at once, wash away as much of the dirt as possible by gently pouring sterilised water over it freely, notwithstanding the fact that wounds heal best if kept dry. **Never wash the surrounding parts towards a wound.**

4.—Apply tincture of iodine all over the wound and the surrounding skin.

5.—Apply a clean dry dressing and fix with a firm bandage.

General Rules for Treatment of a Wound Accompanied by Venous Hæmorrhage

1.—Place the patient in a suitable position, bearing in mind that blood escapes with less force when the patient sits, and still less when he lies down.

2.—Except in the case of a fractured limb, elevate the bleeding part, as thereby less blood finds its way into it.

3.—Expose the wound, removing whatever clothing may be necessary.

4.—Apply direct digital pressure (except over a fracture or foreign body).

5.—Remove any constrictions, such as collar or garters, from the heart side of the wound.

6.—Apply a firm bandage near the wound on the side away from the heart.

7.—Remove foreign bodies, such as broken glass, bits of clothing, hair, etc., seen in the wound ; do not search for foreign bodies which cannot be seen.

8.—If the wound is obviously dirty, and surgical aid cannot be procured at once, wash away as much of the dirt as possible by gently pouring sterilised water over it freely notwithstanding the fact that wounds heal best if kept dry. **Never wash the surrounding parts towards a wound.**

9.—Apply tincture of iodine all over the wound and the surrounding skin, and cover with a clean, dry, soft and absorbent dressing, such as sterile gauze or lint, boracic lint, a perfectly clean handkerchief or piece of linen. Clean unprinted paper, such as the inside of an envelope, may be used in emergency.

10.—Cover the dressing with a pad of wool, lint or other soft material.

11.—Apply a bandage over the pad firmly; but if the presence of a foreign body or fracture is suspected apply it lightly.

12.—Afford support to the injured part.

13.—Treat shock (see p. 161).

Varicose Veins.

A varicose vein is a permanently dilated or overstretched vein whose walls have lost their elasticity, and has bead-like projections along its course. The veins of the leg are specially apt to become varicose from several causes, such as long standing or tight garters. The first effect is to throw extra work upon the valves, and the bead-like projections are caused by the blood accumulating in the pockets behind the valves. In time the vein becomes so dilated that the valves can no longer span it, thus allowing the backward flow of blood, so that in bleeding from a ruptured

varicose vein the blood may flow from both sides of the wound.

Treatment.

1.—Lay the patient down, and, except in the case of a fracture, raise the leg at right angles to the body.

2.—Expose the wound.

3.—Apply digital pressure to the bleeding point.

4.—Loosen garters if worn.

5.—Apply a firm pad and bandage on the wound.

6.—Apply a bandage firmly on the side of the wound furthest from the heart.

7.—Apply a third bandage between the wound and the heart.

HÆMORRHAGE FROM THE MOUTH.

Blood issuing from the Mouth may come from (*a*) he tongue, the gums, the socket of a tooth after extraction, or the throat; (*b*) the lungs; (*c*) the stomach.

(*a*) Hæmorrhage from the Tongue, the Gums, the Socket of a Tooth, or the Throat.

Treatment.

1.—Give ice to suck or cold water to hold in the mouth.

2.—If bleeding from the front part of the tongue is excessive, compress the part by a piece of clean lint held between the finger and thumb.

3.—If the bleeding is from the socket of a tooth, plug the socket with a piece of clean lint or cotton wool; over this place a small cork or other substance of suitable size, and instruct the patient to bite on it.

(*b*) Hæmorrhage from the Lungs.

Blood from the lungs is coughed up, is bright red in colour, and frothy in appearance through being mixed with air.

Treatment.

As for Hæmorrhage from an Internal Organ (see page 121).

(*c*) Hæmorrhage from the Stomach.

Blood from the stomach is vomited; it is of a dark colour and has the appearance of coffee grounds; it may be mixed with food.

Treatment.

1.—Give nothing by the mouth.

2.—Otherwise treat as for Hæmorrhage from an Internal Organ (see page 121).

HÆMORRHAGE FROM THE NOSE.

Treatment.

1.—Place the patient in a sitting position in a current of air before an open window, with the head thrown slightly back and the hands raised above the head.

2.—Undo all tight clothing around the neck and chest.

3.—Apply cold over the nose and also the spine at the level of the collar ; place the feet in hot water.

4.—Cause the patient to keep the mouth open, and so avoid breathing through the nose.

5.—Do not allow the patient to blow the nose.

HÆMORRHAGE FROM THE EAR CHANNEL.

Blood issuing from the Ear Channel generally indicates a fracture of the base of the skull.

Treatment.

1.—Make no attempt to plug the ear.

2.—Bandage lightly over the ear a dry absorbent dressing.

BRUISES.

A blow anywhere on the surface of the body may cause extensive hæmorrhage beneath the skin, without breaking it—a " black eye " is an instance. The injury is accompanied by discoloration and swelling.

Treatment.

Apply a piece of lint soaked in equal parts of spirit and water, or ice or cold water dressings.

QUESTIONS ON CHAPTER VII.

The numerals indicate the pages where the answers may be found.

	PAGE
How may wounds be classified?	91
How many kinds of hæmorrhage are there? ..	91
How would you recognise arterial hæmorrhage? ..	92
How would you recognise capillary hæmorrhage?	92
How would you recognise venous hæmorrhage? ..	92
What are the objects of First Aid treatment of wounds?	92
Should a blood clot be disturbed? Give reason ..	92
How would you avoid contamination of a wound?	93
State general rules for treatment of a wound accompanied by arterial hæmorrhage ..	93
Would you always elevate a bleeding limb? ..	93
How should pressure be first applied?	94
What is direct pressure and when should it be applied?	94
When should direct pressure not be applied? ..	94
What is indirect pressure and when should it be applied?	94
How should indirect pressure be maintained? ..	94
What is a tourniquet?	94
How would you improvise and apply a tourniquet?	94
Why is accuracy necessary in placing the pad of a tourniquet?	95
When may an elastic bandage be used instead of a tourniquet?	95
Should you invariably remove foreign bodies from a wound?	95
What would you do to an obviously dirty wound?	96

PAGE

How would you dress a wound ? 96
What would guide you in placing a bandage over a wound ? 96
How long would you maintain indirect pressure, and what would guide you in discontinuing it ? 97
Where would you feel the pulse when practising arrest of arterial hæmorrhage ? 97
Describe a " St. John " tourniquet 98
What is the aorta ? 98
Describe the arteries of the head and neck 99
Why is it sometimes necessary to compress the carotid artery both below and above the wound ? 100
What is a ring pad, and what is its use ? 103
Describe the arteries of the upper limbs 103
Describe the arteries of the lower limbs 108
State the general rules for treatment of a wound accompanied by capillary hæmorrhage .. 112
State the general rules for treatment of a wound accompanied by venous hæmorrhage 113
What is a varicose vein ? 114
How may a vein become varicose and what is the treatment ? 114
Where may blood issuing from the mouth come from ? 115
How would you treat bleeding from the gums or throat ? 115
What else would you do if the tongue were bleeding ? 115
And if the bleeding were from the socket of a tooth ? 116
How would you distinguish between bleeding from the lungs and from the stomach ? 116
And what would be the difference in the treatment ? 116

PAGE

How would you arrest hæmorrhage from the nose ? 116

Of what is bleeding from the ear channel generally a sign and what is the treatment ? 117

What is a bruise ? 117

How would you treat a bruise ? 117

The Student should practise placing supposed patients in a proper position for the arrest of hæmorrhage (see pages 91, etc.), folding firm pads, tying hard knots in bandages to form a tourniquet (94), and the application of pressure at all the pressure points shown in the frontispiece, at various points on the forehead and scalp, and on the palm of the hand. Pressure should be digital, or by pad and bandage as directed in the text.

Pressure points—Carotid artery, 100. Facial, 100 and 101. Temporal, 101. Occipital, 102. Subclavian, 103. Axillary, 104. Brachial, 105. Radial and Ulnar, 107. Femoral at the groin, 108. Femoral in the thigh, 110. Anterior and posterior Tibia larteries, 110.

Chapter VIII.

INJURIES TO INTERNAL ORGANS.

HÆMORRHAGE FROM AN INTERNAL ORGAN.

Severe injuries to internal organs will usually cause uncontrolled hæmorrhage which will give rise to the following signs and symptoms. If, therefore, no external cause is apparent, it may be assumed that there is bleeding from a blood vessel into one of the organs or cavities of the chest or abdomen.

1.—Rapid loss of strength, giddiness and faintness, especially when the upright position is assumed.

2.—Pallor of the face and lips, and cold clammy skin.

3.—Breathing hurried and laboured, and accompanied by yawning and sighing.

4.—The pulse fails, and may altogether disappear at the wrist.

5.—The patient throws his arms about, tugs at the clothing round the neck, and calls for air (air hunger).

6.—Finally the patient may become totally unconscious.

Treatment.

1.—Obtain medical aid as soon as possible.

2.—Keep the patient in a recumbent position, with head low and turned on one side.

3.—Undo all tight clothing.

4.—Provide for free circulation of air.

5.—Sprinkle cold water on the face; hold smelling salts to the nostrils.

6.—Give ice to suck or cold water to drink, but avoid other forms of stimulants; if the seat of the hæmorrhage is known, apply an ice bag or cold over the region.

7.—Should the patient be collapsed, raise the feet and bandage the limbs firmly from the toes to the hips and from the fingers to the shoulders.

INJURIES TO THE ORGANS WITHIN THE ABDOMEN AND PELVIS.

Injuries of the Stomach may be caused by a crush, blow or stab and are attended by extreme collapse, and sometimes by vomiting of dark blood like coffee grounds.

Treatment.

As for Hæmorrhage from the Stomach (page 116).

Injuries of the Liver, Spleen, Pancreas or Intestines may be caused by a blow, a stab or a bullet; the liver or spleen may be injured by a fracture of the lower ribs. The signs and symptoms are those of hæmorrhage from an internal organ accompanied by pain and swelling at the seat of injury.

Treatment.

As for Hæmorrhage from an Internal Organ (see pages 121 and 122).

The Kidneys may be injured by a fracture of the eleventh or twelfth ribs, also by a crush, blow, stab or bullet. Blood may escape with the urine, and there may be pain and swelling over the injured kidney.

The Bladder may be injured by a fracture of the pelvis. The signs and symptoms are either inability to pass water, or if a little is passed it is tinged with blood.

Treatment of Injury to the Kidneys or Bladder.

1.—**Keep the patient quiet** until the doctor arrives.

2.—**Apply cold** (ice or cold water) dressings over the painful or injured part.

WOUND IN THE FRONT WALL OF THE ABDOMEN.

Treatment.

A. When the intestines or other organs protrude through the wound, whether vertical or transverse:—

1.—Keep the patient on his back, draw the knees well up and raise the head and shoulders.

2.—Apply lint or a soft towel wrung out of sterilised water as hot as can be borne, to which may be added, if readily available, table salt in the proportion of one teaspoonful to a pint of water.

3.—Cover with cotton wool or soft clean flannel.

4.—Apply hot water bottles to both sides of the body and keep the patient warm, avoiding undue pressure on the abdomen.

5.—Give nothing by the mouth.

6.—**A doctor must be obtained as speedily as possible.** If a doctor is not obtainable, change the application described above every half-hour.

B. When there is no protrusion of organs:—

1 (*a*).—If the wound is vertical, keep the patient flat on his back with the lower limbs straight.

(*b*).—If the wound is transverse, keep the patient on his back, draw the knees well up and raise the head and shoulders.

2.—Apply a dry dressing.

3.—Fix the dressing in position with a broad bandage tied tightly.

4.—Keep the patient warm.

5.—Give nothing by the mouth.

6.—Send for a doctor.

RUPTURE.

Rupture (hernia) consists of a protrusion of an internal organ, usually the bowel, through the muscular wall of the abdomen, most frequently at the groin. The signs and symptoms are a sudden swelling and pain, frequently followed by sickness.

Treatment.

1.—Send for a doctor instantly.

2.—Lay the patient down, raise and support the head and shoulders; bend the knees by putting a pillow under them.

3.—Apply ice or cold water dressings to the affected part.

QUESTIONS ON CHAPTER VIII.

The numerals indicate the pages where the answers may be found.

	PAGE
What will severe injuries to internal organs usually cause ?	121
What are the signs and symptoms of uncontrolled hæmorrhage ?	121
Give the treatment	122
How may injuries to organs within the abdomen and pelvis be caused ?	122
What is the difference in treatment between an injury to the stomach and to the liver ? ..	123
State the treatment of injury to the kidneys or bladder	123
State the treatment for a wound in the front wall of the abdomen	124
What is a rupture ?	125
Give the treatment	125

Chapter IX.

MISCELLANEOUS INJURIES.

SCALDS AND BURNS.

A scald is caused by moist heat, such as boiling water, steam, hot oil or tar.

A burn is caused—

(*a*) By dry heat, such as fire or a piece of hot iron.

(*b*) By a rail, wire or dynamo charged with a high pressure electric current, or by lightning.

(*c*) By friction, caused, for example, by contact with a revolving wheel. (Brush burn.)

(*d*) By a corrosive acid, such as oil of vitriol.

(*e*) By a corrosive alkali, such as caustic soda, ammonia, or quicklime.

The effects of a scald or burn may be a mere reddening of the skin; blisters may be formed; or even the deeper tissues of the body may be charred and blackened. The clothing may adhere to the burnt skin, and its removal is impossible without further detriment to the injured part. The great dangers are Shock and Sepsis.

Treatment of Scalds, or of Burns Caused by Dry Heat, Electricity or Friction.

1.—Carefully remove the clothing from the injured part unless it sticks to the skin, when it must be cut around with scissors.

2.—Do not break blisters.

3.—Immediately exclude air :—

(i) Place the injured part in water at the temperature of the body (98.4 degrees) until suitable dressings can be procured. A dessertspoonful of baking soda to a pint of warm water will make a soothing lotion and will serve to soak off any adherent clothing, and should be used if available.

(ii) Dress the wound by applying strips of lint, linen or gauze soaked in a clean solution of baking soda of similar strength and warmth. This dressing should be kept moist until medical aid is obtained.

If the above are not readily available, proceed as in 4.

4.—Cover the part with cotton wool and bandage lightly.

5.—**Treat Shock** (see page 161). Be very apprehensive of danger in the case of even slight burns.

A young child, when severely scalded or burnt, may be placed in a warm bath of the soothing lotion without necessarily removing the clothes and kept there until medical aid is obtained, care being taken to maintain the temperature of the water at 98.4 degrees. This will lessen shock and pain.

When the face is burnt, cut a *mask* out of cotton wool, lint or linen, leaving holes for the eyes, nose and mouth, soak in the soothing lo ion before applying, and keep it moist.

When a person's clothing catches fire :—

(*a*) A person rendering assistance should hold a rug, blanket, coat or table-cover in front of himself when approaching the burning patient.

(*b*) Lay the patient flat on the floor at once, so that the flames are uppermost ; that is to say, if the front of the clothing is on fire lay him on his back, and if the back of the clothing is burning, place him face downwards. The reason for this is that flames ascend, so that if the upright position is assumed, the flames will quickly reach and burn the body, neck, and face ; or if the patient lies with the flames undermost,

they will, if unextinguished, set fire to the rest of the clothing.

(*c*) As soon as the patient is laid flat, smother the flames with the blanket, or other article.

(*d*) If a person's clothing catches fire when nobody is by, he should lie flat, flames uppermost, smother the flames with anything handy, and call for assistance; on no account should he rush into the open air.

The use of fire guards would prevent many calamities.

Treatment of Burns Caused by a Corrosive Acid.

1.—If it can be obtained quickly, **bathe the part freely with an alkaline lotion,** such as a dessertspoonful of baking soda or washing soda in one pint of warm water. Otherwise thoroughly flood the burnt part with warm water.

2.—Treat as a burn.

Treatment of Burns Caused by a Corrosive Alkali.

1.—If it can be obtained quickly, **bathe the part freely with an acid lotion,** such as vinegar or

lemon-juice diluted with an equal quantity of warm water. Otherwise thoroughly flood the burnt part with warm water. *Before using water, brush off any lime that remains on the part.*

2.—Treat as a burn.

STINGS OF PLANTS AND INSECTS.

These give rise to serious inconvenience, and in some cases grave symptoms develop.

Treatment.

1.—**Extract the sting** if present.

2.—**Mop the part freely with spirit, tincture of iodine or dilute ammonia.** A paste of baking soda and sal volatile is an efficient application. A solution of washing soda (a dessertspoonful to a pint of water) or the application of the wet blue bag will relieve pain.

3.—**Apply a dry dressing.**

4.—**Treat shock** (see page 161).

WOUNDS BY POISONED WEAPONS, AND BITES OF SNAKES AND RABID ANIMALS.

Wounds by poisoned weapons, and the special poisons introduced into bites by venomous snakes, cause immediate danger to life. Hydrophobia is

caused by the bite of an animal, such as a dog, cat, fox, wolf, or deer suffering from rabies.

Treatment.

1.—Immediately place a constriction (a piece of cord or tape, or a handkerchief) **between the wound and the heart,** as near the trunk as possible, adding one or two more constrictions between it and the wound so as to prevent the venous blood from carrying the poison through the body.

2.—Give alcohol, such as brandy (in the case of an adult two tablespoonfuls in a wineglass of water).

3.—Encourage bleeding so as to wash the wound from within outwards :—

(*a*) By bathing the wound with warm water.

(*b*) By keeping the affected part low ; the upper limb should be allowed to hang down, and in the case of the lower limb the patient should be seated with the foot on the ground.

4.—*If it is quite impossible to obtain the services of a doctor,* apply a fluid **caustic,** such as pure carbolic acid or nitric acid, on a piece of wood, such as a match, cut to a point to ensure the caustic reaching the bottom of the wound.

In the case of a bite by a venomous snake do not use caustic, but scratch the skin round the wound and rub in powdered permanganate of potash.

If these are not available, apply iodine or spirit copiously.

5.—Now remove the constrictions.

6.—Apply a dressing when bleeding has ceased, and retain in position with a bandage.

7.—Afford support to the injured part.

8.—Treat shock (see page 161).

FROST BITE.

During exposure to severe cold, parts of the body, usually the feet, fingers, nose, or ears, lose sensation and become first waxy white and afterwards congested and of a purple appearance. As sensation is lost in the part, it is often only by the remarks of bystanders that the frost-bitten person is made aware of his condition.

Treatment.

1.—Do not bring the patient into a warm room until, by **mild friction and the application of dry, gentle warmth,** sensation and circulation in the affected parts are restored. Neglect of this

precaution may lead to death of the tissues of the frost-bitten part. Avoid the application of moisture in any form.

2.—When circulation is restored, keep the patient in a room at a temperature of 60 degrees.

NEEDLE EMBEDDED UNDER THE SKIN.

When a needle breaks off after penetrating the skin and disappears, take the patient and the broken piece of needle to a doctor at once. If the wound is near a joint, keep the limb at rest on a splint.

FISH-HOOK EMBEDDED IN THE SKIN.

If the hook is a large one or deeply embedded, take the patient to a doctor at once. If the hook is a small one, do not attempt to withdraw it by the way it went in, but cut off the dressing of the hook, so that only the metal is left, and then force the point onwards through the skin until the hook can be pulled out, thus making a second opening in the skin. Afterwards apply tincture of iodine and a dry dressing.

FOREIGN BODY IN THE EYE.

1.—Prevent the patient rubbing the eye, tying down a child's hands if necessary.

2.—Pull down the lower eyelid, when, if the foreign body is seen, it can readily be removed with a camel's hair brush, or with the corner of a handkerchief twirled up and wetted with clean water.

3.—When the foreign body is beneath the upper eyelid lift the lid forward, push up the lower lid beneath it and let go. The lashes of the lower lid brush the inner surface of the upper one, and may dislodge the body. Should the first attempt be unsuccessful, repeat it several times if necessary. If the foreign body is not dislodged, take the patient to a doctor as soon as possible. **When, however, skilled help cannot be had,** proceed as follows :—

(*a*) Seat the patient so as to face the light, and stand behind him, steadying his head against your chest.

(*b*) Place a knitting-needle, match or bodkin on the upper eyelid, half-an-inch above the edge, pressing it backwards as far as possible. Pull the upper eye-lashes upwards over it, and thereby evert the eyelid.

(*c*) Remove the foreign body, as in 2 above.

4.—When a foreign body is embedded in the eyeball do not attempt to remove it, but drop olive or castor oil on the eyeball after pulling down the lower eyelid, close the lids, apply a soft pad of

cotton wool, and secure it by a bandage tied sufficiently firmly to keep the eyeball steady ; take the patient to a doctor.

When quick-lime is in the eye brush away as much of it as possible, bathe the eye with vinegar and warm water (one part in four), and treat as for a foreign body embedded in the eyeball. If vinegar is not readily obtainable, wash freely with warm water.

When oil of vitriol is in the eye bathe the eye with a solution of baking soda (a dessertspoonful in a pint of warm water) and treat as for a foreign body embedded in the eyeball.

FOREIGN BODY IN THE EAR PASSAGE.

If an insect is in the ear passage, fill the ear with olive oil, when the insect will float and may be removed. Otherwise make no attempt to treat a patient with a foreign body in the ear, but take him to a doctor as soon as possible : any attempts to remove the foreign body may lead to fatal consequences. If a child cannot be induced to keep the fingers from the ear, tie his hands down to prevent him pushing the foreign body further. Never syringe or probe the ear.

FOREIGN BODY IN THE NOSE.

Cause the patient to blow his nose violently after closing the unaffected nostril. Induce sneezing by pepper or snuff. If this is ineffectual, take the patient to a doctor.

QUESTIONS ON CHAPTER IX.

The numerals indicate the pages where the answers may be found.

	PAGE
How is a scald caused?	127
How may a burn be caused?	127
What are the great dangers of a scald or burn? ..	127
State the general treatment for scalds and burns not caused by a corrosive	128
How would you treat a young child who is severely burnt?	129
What would you do when a person's face is burnt?	129
What steps should be taken when a person's clothing catches fire?	129
How would you treat a burn caused by a corrosive acid?	130
How would you treat a burn caused by a corrosive alkali?	130
How would you treat a sting?	131
State the rules for treatment of a poisoned wound..	132

PAGE

State the signs, symptoms and treatment of frost-bite 133
Would you attempt to remove a needle embedded under the skin ? 134
How would you extract a fish-hook embedded in the skin ? 134
State the general rules for removing a foreign body from the eye 134
What would you do if a foreign body were embedded in the eyeball ? 135
And when quick-lime is in the eye ?.. 136
And when oil of vitriol is in the eye ? 136
How would you try to remove an insect from the ear passage ? 136
Would you try to remove any other form of foreign body from the ear passage ? 136
How would you remove a foreign body from the nose ? 137

Chapter X.

THE RESPIRATORY SYSTEM.

The organs concerned in Respiration are the Nose, the Throat, the Windpipe (Trachea), the Air Tubes (Bronchi) and Air Cells (Lungs).

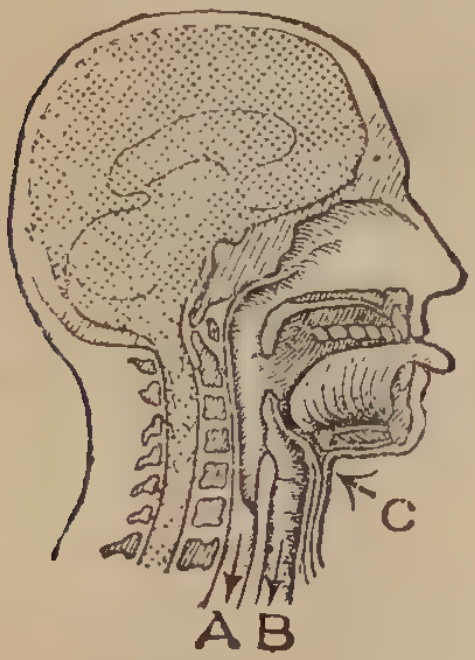


Fig. 61.

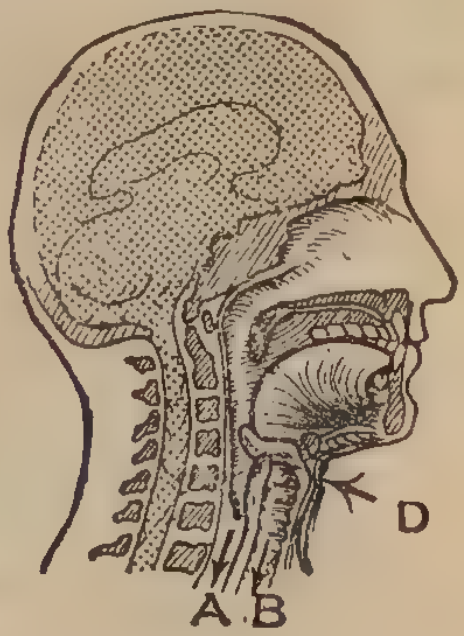


Fig. 62.

A. Gullet. B. Windpipe.
C. Epiglottis open. D. Epiglottis closed.

Air is conveyed by the nostrils (or mouth) to the back of the throat, whence it enters the windpipe by an opening guarded by a flap (the epiglottis) against the entry of solids or fluids. During insensibility

however, the flap may fail to act, so that, should solids or fluids be given by the mouth, they may enter the windpipe and cause choking. Another danger is that the tongue of an insensible person is very apt to fall back on the flap, and so obstruct the windpipe. (Figs. 61 and 62.) The windpipe extends to two inches below the top of the breast-bone, where it divides into the right and left bronchus. Each bronchus enters a lung and divides into small and still smaller bronchial tubes, until the ultimate recesses of the lung—the air cells or air spaces—are reached.

The **Lungs,** Right and Left, occupy the greater part of the chest; they lie immediately within the ribs, and practically wherever a rib is felt, whether front, back or sides, there is lung beneath. Each lung is enveloped in a fine membrane (the pleura), which allows it to move within the chest freely during breathing.

Respiration, or breathing, consists of two acts—Inspiration, an enlargement of the chest cavity, during which air is drawn into the lungs, and Expiration, a diminution of the chest, during which air is driven out of the lungs. A pause follows the act of expiration. In health fifteen to eighteen breaths are taken per minute, and at each inspiration about twenty to thirty cubic inches of air enter the lungs, and a similar quantity is expelled at each expiration.

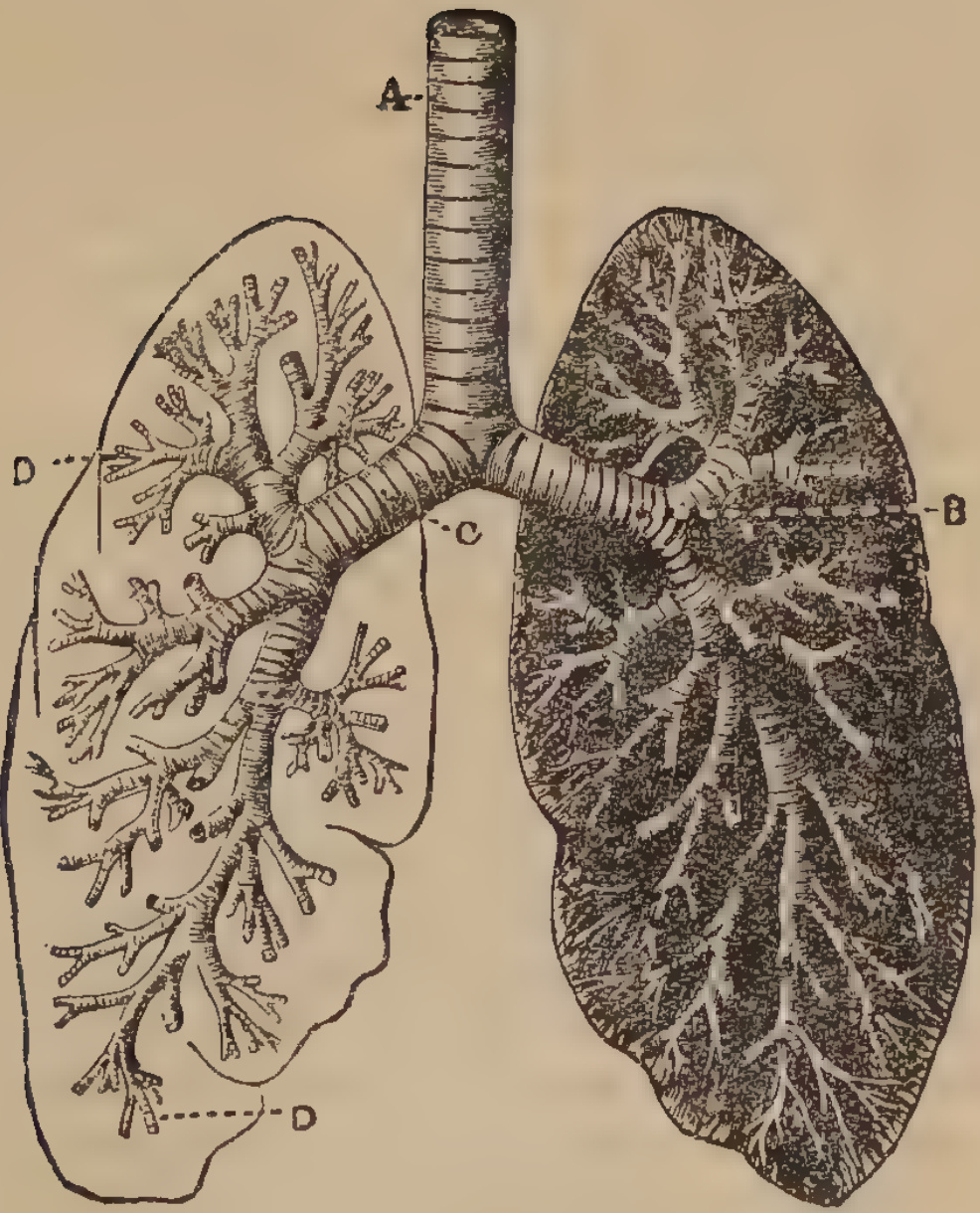


FIG. 63.—THE LUNGS AND BRONCHIAL TUBES.

A. Trachea, or Windpipe. B. Left Bronchus. C. Right Bronchus. D. Smaller Bronchial Tubes.

The enlargement and diminution of the chest cavity are effected partly by the muscles of respiration attached to the ribs, but chiefly by the diaphragm, the large arched muscular partition which separates the chest from the abdomen. In inspiration, which is chiefly a muscular act, the ribs are raised, and the diaphragm contracts and becomes flattened, thus increasing the capacity of the chest, tending to produce a vacuum and causing air to enter. In expiration, an act performed without muscular effort, the ribs fall and the arch of the diaphragm rises; this lessens the capacity of the chest and forces air out. In the capillaries of the lungs the air gives off to the blood its oxygen and takes up from it carbonic acid gas, heat and water; thus the air expired becomes warmer and contains carbonic acid and watery vapour, and the impure dark red blood becomes purified and of bright red colour.

As the blood depends upon air for its purification and the oxygen necessary to maintain life, interference with breathing very soon may produce a dangerous state called asphyxia, examples of which are afforded by drowning, suffocation, choking, etc.

It should not, however, be assumed that death is present because signs of life are absent. Prompt steps should be taken to ensure that breathing is possible, i.e., that the air passages are not obstructed.

that pressure does not prevent the necessary expansion of the chest and that there is an abundance of pure air.

If natural breathing is seen to be failing or cannot be discerned, artificial means of restoring it must be resorted to as follows :—

Artificial Respiration.

1.—**Adjust the patient's position.**—At once lay the patient in a prone position (*i.e.*, back upwards), with arms extended above the head, and his head turned to one side, so as to keep his nose and mouth away from the ground (see Figs. 64 and 65). Do not waste time in loosening clothing; no pad is to be placed under the patient, nor need the tongue be drawn out, as it will fall naturally towards the lips.

To turn the patient to the prone position, stand at his side, grasp the clothing at the hip on the opposite side of the body and pull smartly over.

2.—**Imitate the movements of breathing.**

(*a*) *Induce expiration.*—Kneel at one side of or across the patient, facing his head, and place your hands over the lower ribs, the thumbs nearly parallel and close to the spine, the fingers slightly open and pointing towards the shoulders. Keeping your arms quite straight and rigid and leaning your body

forward, slowly apply firm but not violent pressure straight downwards upon the lower part of the

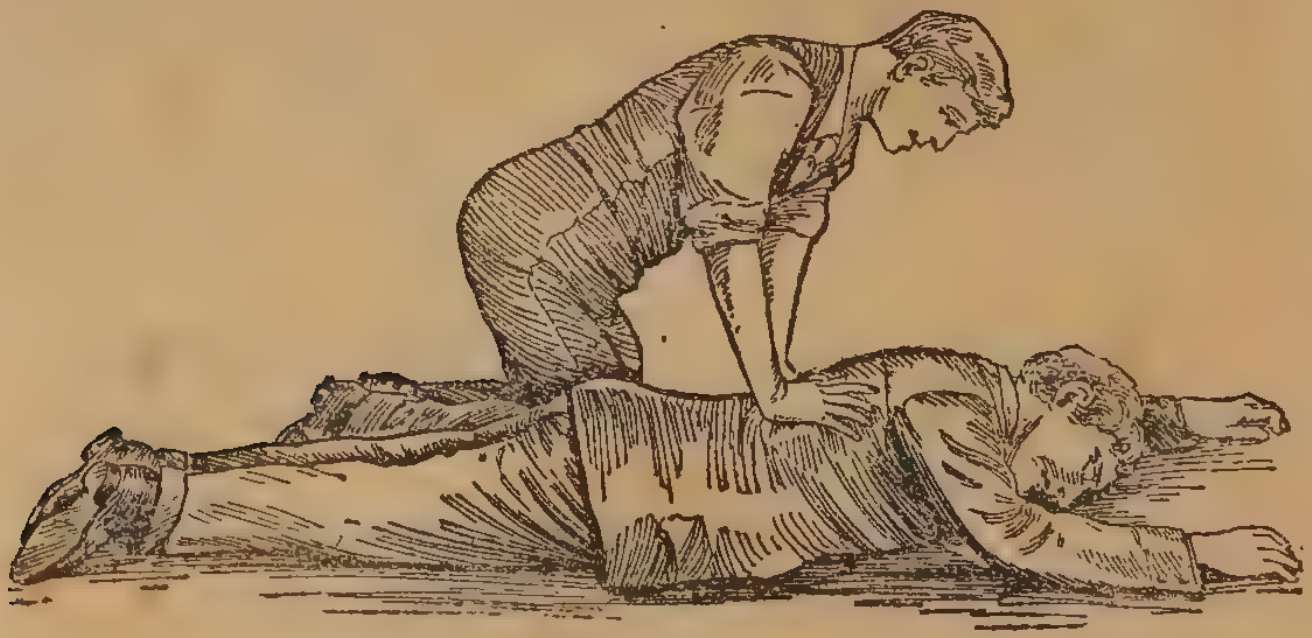


FIG. 64.

FIG. 65.

chest, thus driving air out and producing expiration (Fig. 64).

(*b*) *Induce inspiration.*—Draw back your body somewhat more rapidly and relax the pressure, but do not remove your hands ; this produces inspiration (Fig. 65).

(*c*) *Alternate these movements* by a rhythmic swaying forwards and backwards of your body from the knee joints, twelve to fifteen times a minute.

The above is a modification of Schafer's method of artificial respiration.

Whilst artificial respiration is being done, other useful steps may be employed to excite respiration, such as applying smelling salts to the nostrils, or flicking the patient with a wet towel.

Artificial respiration must be done perseveringly until respiration is restored or a doctor pronounces life to be extinct.

Constant thought and practice is necessary for the efficient performance of artificial respiration.

When natural breathing begins, regulate the artificial respiration to correspond with it, and promote circulation by rubbing the limbs energetically towards the heart.

Watch the patient carefully for some time to see that the breathing does not fail ; if it does, at once begin artificial respiration again.

QUESTIONS ON CHAPTER X.

The numerals indicate the pages where the answers may be found.

	PAGE
What are the organs concerned in respiration ? ..	139
What guards the windpipe against the entry of solids or fluids ?	139
What may occur during insensibility ?	140
Where are the lungs situated ?	140
How are the enlargement and diminution of the chest affected ?	140
What occurs in the capillaries of the lungs ? ..	142
What is asphyxia ?	142
What steps should be taken to ensure breathing is possible ?	143
Describe artificial respiration	143
What other steps may be employed whilst artificial respiration is being done ?	145
What should be done when and after natural breathing begins ?	145

Chapter XI.

ASPHYXIA.

A continuous want of pure air produces a condition known as Asphyxia, which will cause loss of consciousness. Asphyxia may be brought about as follows :—

I. Obstruction of the air passages.

(*a*) By drowning.

(*b*) By pressure from outside : Strangulation, hanging, smothering.

(*c*) By a foreign body (*e.g.*, a piece of food, false teeth, etc.) in the throat : Choking.

(*d*) By swelling of the tissues of the throat : Inflammation, scald of the throat, poisoning by a corrosive, or stings of insects.

II. Inhaling poisonous gases, such as coal gas (as used in the house), water gas, smoke, fumes from a charcoal or coke fire or motor exhaust, sewer gas, Lme-kiln gas, carbonic acid gas.

III. Pressure on the chest, as when crushed by sand or debris, or by a crowd.

IV. Nervous affections, as the result of narcotic and certain other poisons, electric shock, or stroke by lightning.

General Rules for Treatment of Asphyxia.

1.—Remove the cause of the asphyxia or the patient from the cause—whichever is more expedient.

2.—Perform artificial respiration.

3.—Undo all tight clothing about the neck, chest and waist.

4.—Arrest hæmorrhage when apparent.

5.—Obtain a doctor's help as soon as possible.

6.—Promote warmth by extra coverings, hot flannels, hot water bottles or hot bricks (wrapped in flannel) applied to the feet, to the limbs and body.

7.—When the power of swallowing has returned give hot tea, coffee or meat extract, in sips, but first test ability to swallow by introducing a teaspoonful of cold water at a time between the gums and the cheek.

Additional Treatment in Special Cases.

Drowning.

While artificial respiration is being performed instruct bystanders to remove wet clothing as far as possible, and to wrap the patient in dry blankets or other clothing.

Strangulation.

Cut and remove the band constricting the throat.

Hanging.

Do not wait for a policeman: grasp the lower limbs and raise the body to take the tension off the rope; cut the rope, and free the neck.

Choking.

To dislodge the obstruction thump the back hard between the shoulder blades. A child may be turned upside down and thumped on the back. If this is unsuccessful open the mouth, forcibly if need be, pass two fingers along the tongue right to the back of the throat and try to pull up the foreign body. If this is impossible push it back into the gullet. If vomiting results immediately turn the head on one side.

Swelling of the Tissues of the Throat.

If possible, place the patient before the fire. Apply a sponge, piece of flannel or other cloth, wrung out of very hot water, to the front of the neck, from the chin to the top of the breast-bone. If breathing has not ceased or has been restored, give ice to suck or failing ice, cold water to drink. Also give oil (not lamp or machine oil), a dessertspoonful at a time.

Suffocation by Smoke or Gases.

Before entering a building or room full of smoke

or poisonous gas tie a handkerchief, wet if possible, over the nose and mouth. As the majority of gases are lighter than air, keep low, and quickly but cautiously drag the patient out.

Electric Shock.

1.—As it is generally impossible or inexpedient to switch off the current, some other method must usually be adopted ; but precautions must be taken, or else the person rendering assistance will himself receive a dangerous, or even fatal shock. He should therefore protect himself by standing, if possible on a body which resists the current, such as india-rubber, linoleum, glass or any other non-metallic substance. He should also protect his hands by using a non-conducting material, such as india-rubber gloves, tobacco pouch, mackintosh or other articles of dry clothing.

If no means of protection are at hand, an attempt may be made to drag the sufferer away by means of a loop of dry rope or a crooked stick ; an umbrella is not safe because the metal ribs would act as conductors of electricity, and it is not infrequently the case that the "stick" of the umbrella is a metal tube. Care should be taken to avoid touching with naked hands the sufferer's hands, wet clothing, or boots if the soles are nailed. The armpits should be

avoided, as perspiration usually makes the clothing damp there.

2.—As in these cases efforts at natural breathing may become spontaneous only after a long time and shock is severe, it is especially important to persevere with the general rules for the treatment of asphyxia.

3.—Treat any burns that may be present.

QUESTIONS ON CHAPTER XI.

The numerals indicate the pages where the answers may be found.

	PAGE
What is asphyxia?	147
How may it be brought about?	147
Give the general rules for its treatment	148
What special steps must be taken in drowning, strangulation, hanging, choking, swelling of the tissues of the throat, and suffocation by smoke or gases?	148
How would you liberate a sufferer from contact with an electric current?	150
Why is it especially important to persevere with treatment?	151
What other injury may be present?	151

Chapter XII.

THE NERVOUS SYSTEM.

Two systems of nerves, the Cerebro-spinal and the Sympathetic, regulate the movements and functions of the body.

The Cerebro-spinal System.

The Cerebro-spinal System is made up of the Brain, Spinal Cord and Nerves; through its agency sensations are received and the will causes the action of the voluntary muscles. For example, when a part is injured a sensation of pain is conveyed to the brain by a sensory nerve, thus affording an indication of the seat of injury, or a warning of a possible danger of further damage. On attention being directed to the injury, motor nerves convey a message to the muscles, and an attempt is instantly made to ease the pain by moving the injured part.

The **Brain,** situated within the cranium, is the seat of intellect, the emotions, and the will; it is the organ where impressions brought by sensory nerves are received, and from which orders are given through the motor nerves.

The **Spinal Cord,** which is a continuation of the

brain, consists of nerve tissue lying within the spinal canal (see Vertebral Column, page 38). It leaves the brain through an opening in the base of the skull, and extends to the second lumbar vertebra.

The **Nerves** proceed from the brain and spinal cord in pairs as pearly-white trunks, and their branches can be traced throughout the tissues of the body. When a nerve is severed there is loss of power and sensation in the region in which its branches are distributed.

The Sympathetic System.

The Sympathetic System consists of a network of bodies of nerve tissue (ganglia) and nerves; it controls the involuntary muscles, and regulates the vital functions of the body. The main part of the network (solar plexus) is situated in the upper part of the abdomen behind the stomach; when it is struck, as in "winding" in football and boxing, severe collapse may result. The Sympathetic System is not under the control of the will, and acts alike during sleep and activity.

QUESTIONS ON CHAPTER XII.

The numerals indicate the pages where the answers may be found.

	PAGE
How many systems of nerves are there ?	152
What do they do ?	152
Of what is the cerebro-spinal system made up ? ..	152
What is the brain ?	152
What is the spinal cord ?	153
What are the nerves ?	153
What does the sympathetic system consist of ? ..	153
What does it control ?	153
Where is the solar plexus situated ?	153
What may result when it is struck ?	153
In what respect does the sympathetic system differ from the cerebro-spinal ?	152-153

Chapter XIII.

INSENSIBILITY.

Loss of consciousness (**Insensibility**), apart from natural sleep, may be partial (Stupor) or complete (Coma).

In stupor the patient can be aroused with some difficulty, but not at all in coma. In stupor the pupils of the eyes (the black part surrounded by the coloured iris) respond to light—that is, contract in a bright light and expand or dilate when the light is shaded, but not in coma. Also the patient will object to the eyeballs being touched in the former but not in the latter state.

General Rules for Treatment of Insensibility.

1.—Lay the patient on his back with his head turned on one side and

(*a*) If the face is flushed, raise the head and shoulders.

(*b*) If the face is pale, lower the head and raise the feet.

2.—Undo all tight clothing about the neck, chest and waist.

3.—Ensure an abundance of fresh air. Open windows and doors; keep back a crowd; remove from harmful gases or impure atmosphere.

4.—Arrest hæmorrhage when apparent; minor injuries are less important than the unconscious state.

5.—Obtain a doctor's help as soon as possible.

6.—Adopt the special treatment appropriate for the condition which has caused the insensibility.

7.—Treat any other injuries which may be present.

8.—Promote warmth of the body by covering the patient with extra clothing, rugs or blankets.

9.—Remove the patient to shelter in a recumbent position as soon as expedient.

10.—Give no food or fluids whatever by the mouth while the patient is insensible.

11.—Unless unavoidable, never leave the patient until you have placed him in the charge of another responsible person.

12.—On return to consciousness water may be given to drink in sips. If the pulse is feeble give hot, strong tea or coffee, provided hæmorrhage, either external or from an internal organ, is not apparent or suspected. A desire to sleep should be encouraged, except in cases of narcotic poisoning, a

condition that may generally be recognised by the history of the case, and also by the pupils of the eyes being minutely contracted (pin-point pupils).

Cases of Insensibility, when breathing is present, may be classified as follows :—

A. When there are no convulsions.

(1) Injuries to the head—

(*a*) Concussion.
(*b*) Compression.

(2) Constitutional causes—

(*a*) Shock, collapse, fainting (syncope).
(*b*) Apoplexy.
(*c*) Sunstroke or heatstroke.

B. When convulsions are present.

(1) Constitutional causes—

(*a*) Epilepsy.
(*b*) Hysteria.
(*c* Infantile convulsions.

(2) Poisoning—

(*a*) Strychnine.
(*b*) Prussic acid.
(*c*) Fungi and berries.

These various forms of insensibility are produced by widely different causes and are not always readily

distinguishable one from another. It is, therefore, necessary, *while carrying out the general rules*, to **examine** the patient to ensure the correct additional treatment:—

Depend entirely on your own powers of observation, as, if insensibility is complete, the patient can give no information; and if insensibility is incomplete, information given by the patient is apt to be confused and therefore unreliable.

(*a*) Feel if the pulse beats at the wrist (radial artery), at the temple (temporal artery), or in the neck (carotid artery). The pulse may be absent, slow or quick, feeble or strong. If the pulse cannot be felt, place the hand over the heart to ascertain if it beats.

(*b*) Note if the breathing be slow or quick, deep or shallow, or stertorous (loud snoring and puffing of the cheeks during expiration).

Note the odour of the breath. Do not assume that a person is insensible as the result of drink merely because the breath or mouth smells of alcohol. Frequently when people are feeling ill they take or are given alcoholic stimulants, after which they may become insensible, not from the drink, but from the cause that induced them to

take it ; for example, faintness coming on, effects of poisoning, etc. Even if drink is the actual cause of insensibility, it must be borne in mind that the patient is therefore in a very dangerous state, and must be treated accordingly.

(*c*) Examine the scalp, temples and back of the head for injury ; the ears and nose for hæmorrhage ; and the mouth for blood, froth, burns by corrosives, and for foreign bodies.

(*d*) Raise the eyelids and examine the state of the pupils. In several conditions the pupils are altered ; they may be both widely dilated or both minutely contracted, or, on the other hand, they may be unequal (one large and the other small). The pupils are said to be fixed when in either a bright or a shaded light no alteration takes place in their size.

(*e*) Examine the body and limbs for signs of fractures, dislocations, wounds ; and compare the two sides of the body as to limpness.

(*f*) Notice the temperature of the skin, whether it be normal, hot or cold. The quickest

way of doing this is to place the back of the hand on the bared chest of the patient.

A.—WHEN THERE ARE NO CONVULSIONS.

(1) Injuries to the Head.

(*a*) **Concussion of the brain (stunning)** is a shaking of the brain resulting in a disturbance of its functions and is caused by a blow or fall on the head, or by a fall on the feet or lower part of the spine.

The signs and symptoms are :—The patient is at once in a state of stupor, which may last for a short time only, or may deepen into coma. The face is pale, the pulse quick and weak, and the breathing shallow.

(*b*) **Compression of the brain** may result from the same causes as produce Concussion ; in fact, Compression is frequently preceded by Concussion. Signs of injury are usually present, and the condition is due to pressure on the brain by a blood clot or piece of bone in fracture of the skull (vault or base).

The signs and symptoms are :—The face is flushed ; the pulse full and slow ; the breathing may become stertorous ; loss of power and sensation may be only partial and not complete ; there may be discharge of blood from the nose and ears (fractured base of

skull); the pupil of one eye is larger than that of the other; the temperature of the body is raised.

Compression of the brain differs from concussion also in the fact that the signs and symptoms may not appear at once, but may be delayed for a time.

Special Treatment of Injuries to the Head.

1.—Adopt the general rules for treatment of Insensibility.

2.—Apply ice or cold water to the head continuously.

No case of head injury should be regarded lightly, and a caution should be given to a patient who has been unconscious, even for only a moment, not to resume physical or mental activity without the consent of a doctor.

(2) Constitutional Causes.

(*a*) Shock, collapse, and fainting (syncope).

Shock is a condition of sudden depression of the nervous system resulting from and occurring immediately after injury, or hæmorrhage. It may last only a few moments, or may develop into collapse.

Collapse is a condition resembling shock, but it comes on gradually and is generally due to the effects of a severe accident, hæmorrhage, some exhausting disease or poisons such as alcohol,

tobacco, etc. The symptoms are more prolonged than in shock.

Fainting (syncope) is a condition due to sudden failure of the action of the heart. The cause is heart weakness, which may be aggravated by tight clothing, fatigue, want of food, or a close or crowded room; or it may be mental, such as fright, dread, sudden bad news, or sometimes the sudden removal of fear or anxiety after prolonged suspense.

In each the signs and symptoms are the same—If standing, the patient will turn giddy and fall; the pulse is rapid and weak, or almost imperceptible; the breathing is quick, sighing and irregular; the face is pale and the skin becomes cold and clammy.

An attendant danger of these conditions is the liability to sudden relapse after a temporary improvement, and the utmost care and watchfulness must be exercised to maintain the heat of the body and so guard against failure of the heart and lungs.

Special Treatment.

1.—Adopt the general rules for treatment of Insensibility.

2.—Sprinkle the face with hot and cold water alternately, and apply warmth to the pit of the stomach and over the heart; vigorous friction of

the limbs upwards has a stimulating effect. Smelling salts may be held to the nose.

3.—Guard against any bleeding which may occur later. If collapse has been caused by severe injury, the wound will not bleed to any marked extent while the action of the heart is feeble. The wound must be carefully watched to be sure that bleeding does not recur as the patient begins to regain consciousness and the heart's action improves; or, if there is no wound, look for signs of hæmorrhage from an internal organ.

4.—Give food, sparingly at first, if want of nourishment has been the cause of the condition.

(*b*) **Apoplexy** usually occurs in elderly people, and is due to the rupture of a diseased blood vessel causing hæmorrhage into the brain tissue; no signs of injury are necessarily present.

The signs and symptoms usually present are—the face is flushed; the pulse slow and full; the breathing stertorous; one side of the body more limp than the other, and the pupil of one eye larger than that of the other; the temperature of the body raised.

Special Treatment.

1.—Adopt the general rules for treatment of Insensibility.

2.—Promote warmth in the lower part of the body by applying hot-water bottles to the abdomen and lower limbs. As the patient is insensitive to pain, care must be taken lest he be burnt by the bottles; they should be wrapped in flannel, and their heat tested with the bare elbow after allowing time for the heat to come through the flannel.

3.—Apply ice or cold water to the head continuously. Merely sprinkling the head with cold water acts as a stimulant to the circulation in the head, and does more harm than good.

(c) **Sunstroke or Heatstroke** may be caused by exposure to the rays of the sun during a march in very hot weather when heavily burdened, or to great heat, as in the stoke-hole of a steamer, especially in the tropics.

The signs and symptoms are—the face is very flushed; the pulse quick and bounding; the breathing is at first difficult; the patient develops sickness, faintness, giddiness, thirst; the skin becomes dry and burning. A very high temperature, stertorous breathing and insensibility (either stupor or coma) may ensue.

In Sunstroke or Heatstroke congestion extends not only to the brain but to the whole of the spinal cord; consequently the area to be relieved is greater, and different treatment is necessary.

Special Treatment.

1.—Adopt the general rules for treatment of Insensibility.

2.—Remove the patient to a cool, shady spot, and strip him to the waist.

3.—Fan him vigorously.

4.—Apply ice bags or cold water freely to the head, neck and spine, and maintain until the symptoms subside.

B.—WHEN CONVULSIONS ARE PRESENT.

Convulsions are involuntary contractions of the muscles of the body and limbs; they may be general or they may be limited to the limbs on one side of the body.

1.—Constitutional Causes.

(*a*) **Epilepsy** is a sudden and complete loss of consciousness occurring in persons of any age, but usually in young adults.

The signs and symptoms usually present are—the patient falls to the ground, sometimes with a scream, and passes into a state of convulsion affecting the whole of the body and limbs, which may in consequence be injured through contact with surrounding objects; the face is flushed and later livid;

frothing at the mouth and biting of the tongue may occur.

Special Treatment.

1.—Pull the patient away from a source of danger, such as machinery, a wall or fireplace, to prevent him hurting himself; but do not forcibly restrain the patient's limbs. Light pieces of furniture should be moved out of the way.

2.—Support the patient's head, and after wrapping a pencil or similar hard substance in a handkerchief, hold it between his teeth to prevent the tongue being bitten.

3.—Adopt the general rules for treatment of Insensibility.

4.—Encourage sleep.

5.—Carefully watch the breathing.

(*b*) **In Hysterical Fits** (**Hysteria**) the patient, usually a young girl, in consequence of mental excitement suddenly loses command of her feelings and actions. She subsides on a couch or in some comfortable position, throws herself about, grinding her teeth and clenching her fists; she clutches at anyone or anything near her, kicks, cries and laughs alternately. The eyeballs may be turned upwards, and the eyelids opened and shut rapidly. At times

froth appears at the lips, and other irregular symptoms may develop. Complete insensibility is not present.

Special Treatment.

1.—Avoid sympathy with the patient, and speak firmly to her.

2.—Threaten her with a cold water douche, and if she persists in her "fit," sprinkle her with cold water.

3.—Apply a mustard leaf at the back of the neck.

(*c*) **Infantile Convulsions** may occur in the early years of life.

The signs and symptoms usually present are—twitchings of the muscles of the limbs and trunk; blueness of the face; occasional squinting; "holding of the breath" and froth at the mouth.

Special Treatment.

1.—Support the child for fifteen to twenty minutes if necessary in a warm bath slightly above the temperature of the body so that the water reaches to the armpits.

2.—Keep a sponge frequently dipped in cold water on the top of the head as long as the child is in the bath.

3.—On removal from the bath, wrap the child in a warm blanket and still keep the head cool.

4.—Adopt as far as applicable the general rules for treatment of Insensibility.

2.—Poisoning.

(*a*) Strychnine.
(*b*) Prussic Acid.
(*c*) Fungi and berries.

For signs, symptoms and treatment, see Poisons (Chapter XIV.).

QUESTIONS ON CHAPTER XIII.

The numerals indicate the pages where the answers may be found.

	PAGE
What are the degrees of insensibility ?	155
How does stupor differ from coma ?	155
State the general rules for treatment ?	155
How may the causes of insensibility be classified when breathing is present ?	157
Why and how would you examine an insensible person ?	158
What is concussion of the brain ?	160
State the signs and symptoms of concussion, and of compression	160

PAGE

What caution should be given to a patient who has been unconscious even for a moment, after an injury to the head ? 161
Define shock, collapse and fainting 161
State the signs, symptoms and treatment of each .. 162
State the attendant danger of these conditions, and the provisions that should be made to guard against it 162
What is apoplexy ? 163
State its signs, symptoms and treatment 163
How may sunstroke and heatstroke be caused ? .. 164
State signs, symptoms and treatment of sunstroke or heatstroke 164-165
What are convulsions ? 165
What is epilepsy ? 165
State its signs, symptoms and treatment 165
Describe a hysterical fit 166
State the signs, symptoms and treatment of infantile convulsions 167

Chapter XIV.

POISONS.

A poison is any substance which when taken into the body in sufficient quantity is capable of destroying life.

It may be taken either accidentally or intentionally :—

(*a*) By the mouth.

(*b*) Through the lungs, by the inhalation of poisonous gases or fumes. (Asphyxia.)

(*c*) By injection under the skin. (*e.g.* Snake-bite.)

Poisons may be divided into three classes :—

(*a*) **Corrosives,** which actually burn parts with which they come in contact, and thus cause intense pain, corrosion of mouth and throat, and possibly retching, difficulty in breathing and collapse.

These consist of the strong acids and alkalies.

(*b*) **Irritants,** which irritate the parts with which they come in contact and when taken by the mouth cause burning sensation in throat and pit of stomach and retching generally accompanied by colic and diarrhœa.

These include poisonous fungi and berries, metallic poisons and decomposing food (ptomaine poisoning). Where several persons who have partaken of the same food develop similar signs and symptoms, such as vomiting, colicky pains and diarrhœa, ptomaine poisoning should be suspected.

(*c*) **Narcotics,** whose action is on the nervous system through the blood circulating in the brain. They include :—

(i) Those which at once induce a tendency to go to sleep, developing into stupor and later coma. The pupils become minutely contracted (pin-point pupils), the breathing gradually deep and stertorous, and the pulse slow and weak. These include opium and its preparations which are used to relieve pain and induce sleep.

(ii) Those which at first produce delirium, later developing into coma. The pupils are dilated and the pulse quick. These include belladonna, stramonium, chloroform and alcohol.

(iii) Those which produce marked convulsions. There is a feeling of suffocation and the features become livid. Between the

convulsions, which may follow each other rapidly, the patient is in a state of profound collapse. The principal are strychnine, aconite and prussic acid.

General Rules for the Treatment of Poisoning.

1.—Send for a doctor at once, stating what has occurred.

2.—If breathing cannot be discerned, at once apply artificial respiration.

3.—Preserve any vomited matter, food or other substance, suspected of being the poison. Do not wash vessels which may have contained the poison, but carefully guard them.

4.—(a) **Except when the lips and mouth are burned, promptly give an EMETIC**—that is, make the patient vomit and so try to get rid of the poison, by giving either :—

(*i*) *Mustard*—a tablespoonful in a tumblerful (½-pint) of lukewarm water, or

(*ii*) *Salt*—two tablespoonfuls in a tumblerful (½-pint) of lukewarm water.

Repeat the emetic every five minutes until vomiting occurs. If it is retarded, putting the two fingers to the back of the throat may sometimes hasten it.

(b) **If the lips and mouth are burned give NO emetic, but neutralise the poison :—**

(*i*) If an Acid is known to be the poison, at once give an Alkali ; such as lime-water in large quantities, or a tablespoonful of whitening, chalk or magnesia in a tumblerful (½-pint) of water, repeated frequently.

(*ii*) If an Alkali is known to be the poison, at once give an Acid, such as vinegar or lemon juice diluted with an equal quantity of water, by the tumblerful.

(*iii*) If it is not known whether the corrosive poison is an Acid or an Alkali, give copious draughts of cold water.

5.—(a)**In cases of corrosive poisons give olive or salad oil or medicinal paraffin, or demulcent drinks,** such as barley water or gruel; all of these tend to relieve the pain.

If the throat is so swollen as to threaten obstruction to the air passage, apply hot flannels or poultices to the front of the neck, and give frequent sips of cold water or demulcent drinks.

(b)—**In cases of irritant poisons, after the emetic give castor oil,** two tablespoonfuls to an adult, and two teaspoonfuls to a child : or olive or salad oil or medicinal paraffin, or demulcent drinks

such as barley water or gruel: all of these tend to relieve pain. (No oil should be given in phosphorus poisoning.)

(c)—**In cases of narcotic poisons.**

(*i*) Where the patient threatens to go to sleep, keep him awake by walking him about and slapping his face, neck and chest with a wet towel. Give strong black coffee freely.

(*ii*) Where the patient is in a state of delirium promptly give an emetic.

(*iii*) Where the patient is in a state of convulsions give an emetic and apply artificial respiration between the convulsions.

6.—In all cases give milk, raw eggs beaten up with milk or water, cream and flour beaten up together, or strong tea.

7.—Treat shock and collapse.

Poisons which Require Special Treatment.

(*a*).—**Carbolic Acid (Phenol) and Lysol.** The signs and symptoms are those of corrosive poisoning; the characteristic odour of the breath will aid in the detection of this poison.

TREATMENT.

1. If readily available, give Epsom or Glauber Salts, one tablespoonful to a tumblerful of milk or water.

2. General rules.

(*b*).—**Corrosive Sublimate (Perchloride of Mercury).** The signs and symptoms are those of an irritant poison.

TREATMENT.

1. Give white of eggs mixed with milk or water, in unlimited quantities.

2. General rules.

(*c*).—**Iodine.** The signs and symptoms are those of an irritant poison, together with intense thirst; the vomited matter may be yellow or blue.

TREATMENT.

1. Give starch and water freely or, failing this, thin cornflower or arrowroot.

2. General rules.

(*d*).—**Opium** and its preparations. The signs and symptoms are those of narcotic poisoning.

TREATMENT.

1. General rules.

2. Give ten grains (as much as will lie on a sixpenny piece) of permanganate of potassium; or two

tablespoonfuls of Condy's fluid in a tumblerful of water ; repeat the dose in half an hour.

3. Give hot strong coffee.

(*e*).—**Alcohol.** Usually the face is flushed, the eyes bloodshot, the pupils equally dilated and fixed, the temperature of the body lowered ; there is grave danger of collapse.

TREATMENT.

1. Promote warmth of the body.
2. General rules.
3. Give hot strong coffee.

(*f*).—**Strychnine** (contained in many Vermin Killers). The signs and symptoms are a feeling of suffocation, livid features and convulsions during which the patient rests on his head and feet, and the body is arched. Between convulsions, which may follow each other rapidly, the patient is usually in a state of profound collapse.

TREATMENT.

1. Give an emetic and, if breathing is failing, perform artificial respiration, but bear in mind that these can only be done between the convulsions.
2. General rules.

(*g*).—**Prussic Acid and Cyanide of Potassium.** Giddiness, staggering, insensibility accompanied by

panting respiration, profound collapse and possibly convulsions are the general signs, and in addition a smell of bitter almonds is often present. As the action of these poisons is extremely rapid, not a moment should be lost in carrying out the treatment.

Treatment.

1. Apply artificial respiration, even if breathing has not ceased.

2. If the patient can swallow, give freely brandy or sal volatile diluted with an equal quantity of water.

3. Dash cold water on the head and spine continuously.

4. General rules.

QUESTIONS ON CHAPTER XIV.

The numerals indicate the pages where the answers may be found.

	PAGE
What is a poison?	170
How may it be taken?	170
How are poisons classified?	170
State the general signs and symptoms of each class	170
State the general rules for the treatment of poisoning	172
How would you make a patient vomit?	172
What would you give to neutralise poisoning by corrosive acid?	173

PAGE

What would you give to neutralise poisoning by corrosive alkali ? 173
What would you give if it is not known whether the corrosive is an acid or an alkali ? .. 173
What would you give in cases of corrosive poisons ? 173
What would you give if the throat is so swollen as to threaten obstruction to the air passage ? .. 173
What would you give in cases of irritant poisons after an emetic ? 173
What would you do when a person has swallowed poison and threatens to go to sleep ? .. 174
Or is in a state of delirium ? 174
Or is in a state of convulsions ? 174
What would you give in all cases of poisoning ? .. 174
State the signs, symptoms and treatment of carbolic acid poisoning 174
What would you do in the case of poisoning by corrosive sublimate ? 175
What would you do in the case of poisoning by iodine ? 175
What would you give in the case of poisoning by opium ? 175
State the signs, symptoms and treatment of alcoholic poisoning 176
State the signs, symptoms and treatment of poisoning by strychnine 176
State the signs, symptoms and treatment of poisoning by prussic acid or cyanide of potassium .. 176

Chapter XV.

TRANSPORT OF INJURED PERSONS.

(See Syllabus, page 3, Sixth Lecture.)

An injured person may be removed to shelter by the following methods :—

1. Support by a single helper.
2. Hand seats.
3. Stretchers.
4. Wheeled transport.

The method or methods adopted will depend upon the following factors :—

(*a*). The nature of the injury.
(*b*). The severity of the injury.
(*c*). The number of helpers available.
(*d*). The distance to shelter.
(*e*). The nature of the route to be traversed.

After the appropriate First Aid treatment has been given the following principles of transport must be kept in mind :—

A. The position assumed by the patient or in which he has been placed must not be disturbed unnecessarily.

B. Throughout the transport a careful watch must be kept on—

i. The general condition of the patient.

ii. Any dressings, tourniquets, etc., that may have been applied.

C. The transport must be safe, steady and speedy

METHODS OF CARRYING.

If only one bearer is available.

"Cradle."

Lift the patient by passing one of your arms beneath his two knees, and the other round his back. The arms must be passed well under before commencing to lift.

"Human Crutch."

Assist the patient by putting your arm round his waist, grasping his hip and placing his arm round your neck, holding this hand with your free hand (Fig. 66).

"Pick-a-Back."

Carry the patient in the ordinary "pick-a-back" fashion.

If two or more bearers are available.

A.—Hand Seats.

The Two-Handed Seat.

This seat is used to carry a patient who is unable to assist the bearers.

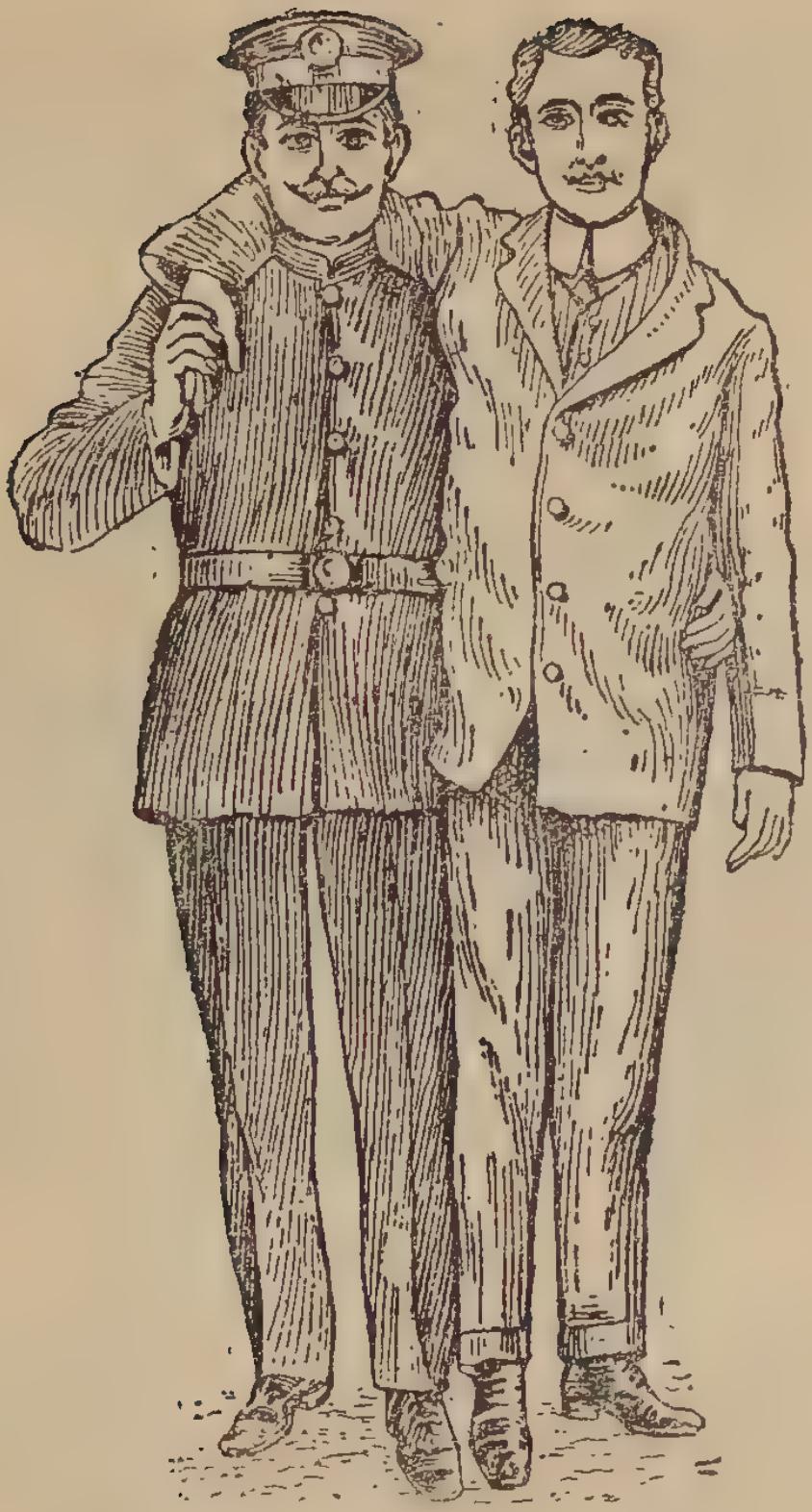


FIG. 66.—"HUMAN CRUTCH."

1.—Two bearers face each other and stoop, one on each side of the patient. Each bearer passes his forearm nearest to the patient's head under his back just below the shoulders, and, if possible, takes hold of his

Fig. 67.

clothing. They slightly raise the patient's back, and then pass their other forearms under the middle of his thighs (Fig. 67), and clasp their hands, the bearer on the left of the patient with his palm upwards,

and holding a folded handkerchief to prevent hurting by the finger nails; the bearer on the right of the patient with his palm downwards, as shown in Fig. 68.

FIG. 68.—(FRONT VIEW.)

2.—The bearers rise together and step off, the right-hand bearer with the right foot, and the left-hand bearer with the left foot (Fig. 69).

THE FORE AND AFT METHOD.

This plan of carrying (see Fig. 70) should only be used when space does not permit of a hand seat.

THE HUMAN STRETCHER.

This is a modification of the two-handed seat, which is used for lifting and carrying a patient in the recumbent position.

1.—Two bearers face each other and stoop, one on each side of the patient. They clasp their left hands beneath the patient's hips in the manner of shaking hands (Fig. 71).

FIG. 69.—TWO-HANDED SEAT.

2.—The bearer on the patient's left passes his right hand and forearm under the patient's head, neck and shoulders.

FIG. 70.—FORE AND AFT METHOD.

3.—The bearer on the right passes his right hand and forearm under the patient's legs.

4.—The bearers rise together and carry the patient, feet foremost, by short side paces (Fig. 72).

The Three-Handed Seat.

This seat is used for carrying a patient and supporting either of his lower limbs, when he is able to use one or both arms.

Fig. 71.

1.—Two bearers face each other behind the patient. For supporting the left limb the bearer to the patient's right grasps his own left wrist with his right hand, and the other bearer's right wrist with his left hand. The bearer to the left grasps the first bearer's right wrist with his right hand

(Fig. 73). This leaves his left hand free to support the patient's left leg. For the patient's right lower

FIG. 72.—HUMAN STRETCHER.

limb follow the same directions, substituting "right" for "left" and "left" for "right." The bearers stoop down.

2.—The patient places one arm round the neck of each bearer and sits on their hands.

3.—The bearers rise together and step off, the

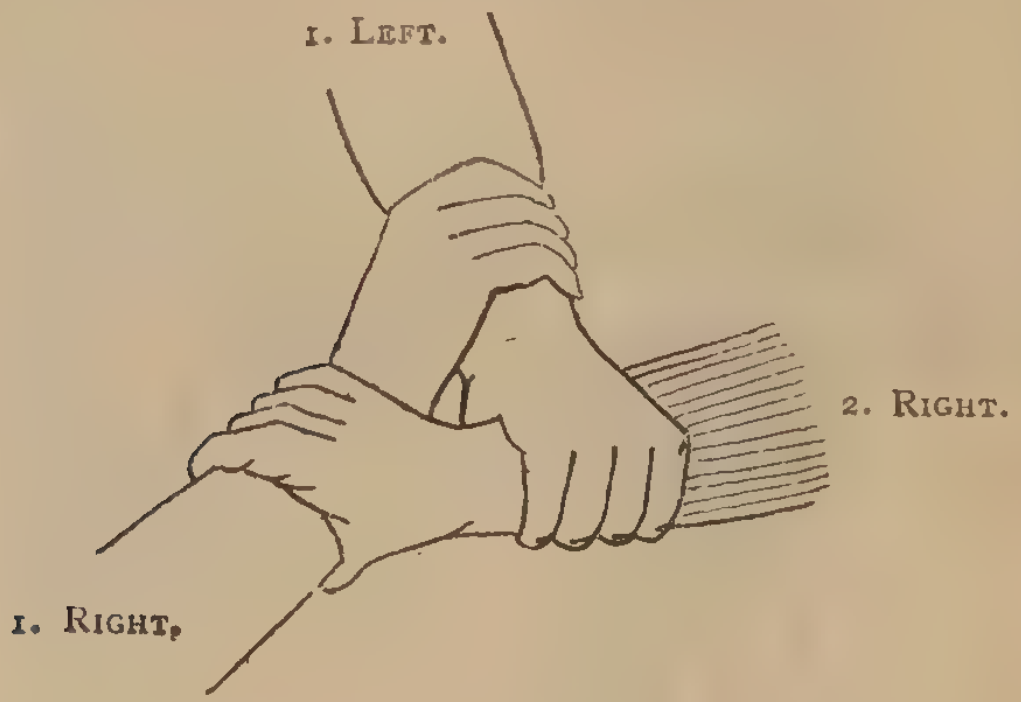


Fig. 73.

right-hand bearer with the right foot, and the left-hand bearer with the left foot.

The Four-Handed Seat.

This seat is used when the patient can assist the bearers by using one or both arms.

1.—Two bearers face each other behind the patient

and grasp their left wrists with their right hands and each other's right wrists with their left hands (Fig. 74), and stoop down.

2.—The patient sits on the hands and places one arm round the neck of each bearer.

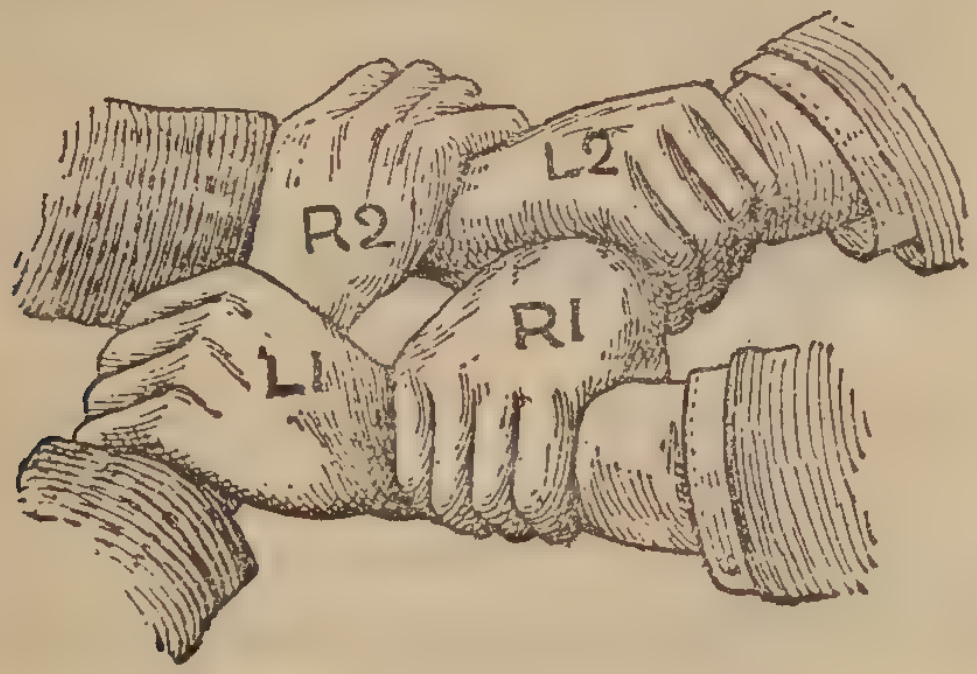


FIG. 74.

3.—The bearers rise together and step off, the bearer on the right-hand side of the patient with the right foot, and the left-hand bearer with the left foot.

B.—Stretchers.

THE "FURLEY" STRETCHERS.

The "Furley" Stretchers (Model 1899) are of three patterns, viz., "Ordinary," "Telescopic-

handled," and "Police." In general principle they are alike, the component parts being designated the poles, handles, jointed traverses, runners, bed, pillow sack and slings.

The Ordinary Stretcher (Fig. 75) is 7 feet 9 inches in length, and 1 foot 10 inches wide. The bed is 6 feet in length, and the handles $10\frac{1}{2}$ inches. The

FIG. 75.—ORDINARY STRETCHER—CLOSED.

FIG. 76.—TELESCOPIC-HANDLED STRETCHER—OPEN.

height is $5\frac{3}{4}$ inches. The weight is 21 to 22 lbs. At the head of the stretcher is a canvas overlay (the pillow sack), which can be filled with straw, hay, clothing, etc., to form a pillow. The pillow sack opens towards the head, and its contents can therefore be adjusted without undue disturbance of the patient. The traverses are provided with joints for

opening or closing the stretcher. The Telescopic-handled pattern (Fig. 76) is very similar, but the handles can be slid underneath the poles, thus reducing the length to 6 feet. This arrangement is of great value when working in confined spaces, or when a patient has to be taken up or down a narrow staircase with sharp turns. The Police stretcher is similar to the Ordinary pattern, but is more strongly made, and has, in addition, straps for securing a refractory patient.

When closed, the poles of the stretcher lie close together, the traverse bars being bent inwards, the canvas bed neatly folded on the top of the poles and held in position by the slings which are laid along the canvas, and secured by a strap, placed transversely at the end of each sling, being passed through the large loop of the other, and round the poles and bed.

STRETCHER EXERCISES.

Originally drawn up by the late Sir John Furley, revised in 1917 to accord with the drills adopted by the Royal Army Medical Corps :—

EXERCISE No. I.

For Four Bearers.

1.—The Instructor selects the bearers and numbers them—1, 2, 3, 4 at his discretion. Should one man

be taller and stronger than the others, he should be No. 3, as he will have to bear the heavier part of the burden. All orders will be given by No. 4.

2.—"Stand to Stretcher."—No. 1 places himself on the left of the stretcher, with his toes in line with the front end of the poles; No. 3 with his heels in line with the rear end of the poles; No. 2 places himself midway between Nos. 1 and 3; No. 4 one pace in the rear of No. 3 (Fig. 77).

3.—"Lift Stretcher."—Nos. 1 and 3 stoop, grasp both handles of the poles firmly with the right hand, rise together, holding the stretcher at full extent of the arm, runners to the right.

4.—"Collect Wounded."—The squad will double by the shortest route to the patient, and halt when one pace from the head of the patient (Fig. 78).

5.—"Lower Stretcher—Prepare Stretcher."—Nos. 2 and 4 proceed to the patient and prepare him for removal; Nos. 1 and 3 turn to the right, kneel on the left knee, unbuckle the transverse straps and place the slings on the ground beside them, separate the poles and straighten the traverses; then each takes up a sling, doubles it on itself, slips the loop thus formed on the near handle, and places the free ends over the opposite handle, buckle uppermost. They then rise, test stretcher and proceed to the patient.

6.—"Load Stretcher."—When the patient is ready for removal on the stretcher, No. 4 will give the command **"Load—Stretcher,"** when the bearers, unless otherwise directed by No. 4, will

FIG. 77.

FIG. 78.

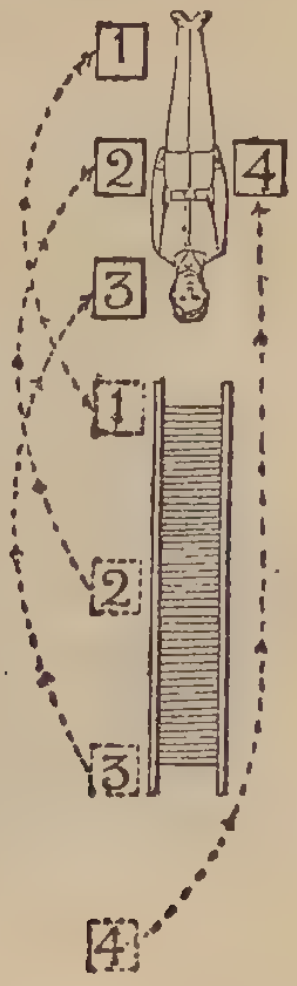


FIG. 79.

place themselves as follows :—Nos. 1, 2 and 3 on the left of the patient, No. 4 on the right ; No. 1 at the knees, No. 2 at the hips, No. 3 at the shoulders,

No. 4 opposite No. 2 (Fig. 79). The whole, turning inwards together and kneeling on the left knee, will pass their hands beneath the patient. No. 1 supports the legs, Nos. 2 and 4 (joining hands) the thighs

Fig. 80.

and hips, No. 3 the upper part of the trunk, passing his left hand across the patient's chest and under the right shoulder, and his right hand beneath the left shoulder (Fig. 80). In lifting the patient off the

ground, special care must be taken of the injured part, No. 4 giving the necessary instructions.

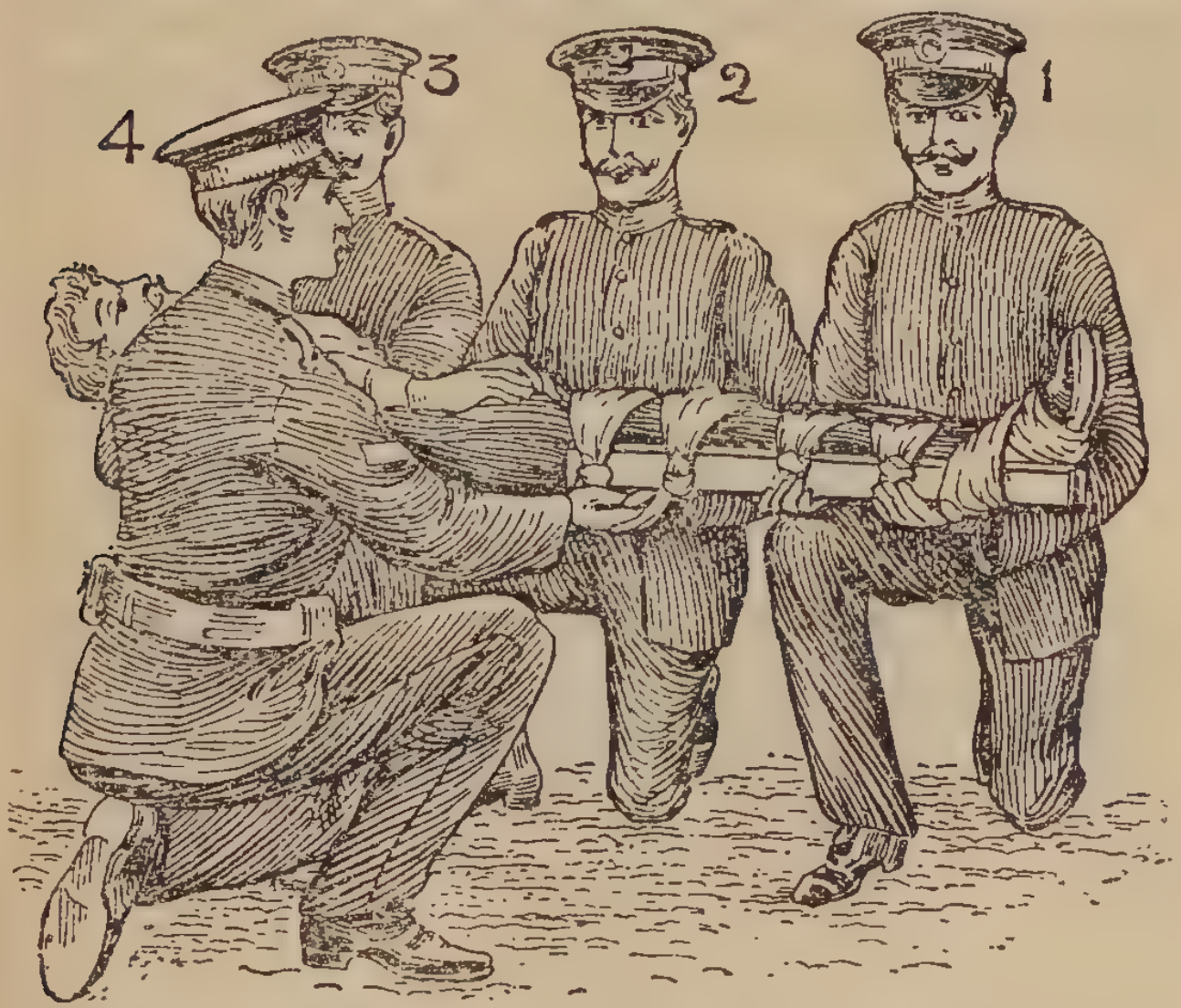


Fig. 81.

7.—"Lift."—The patient will be carefully lifted on to the knees of Nos. 1, 2 and 3 (Fig. 81). No. 4 will disengage, rise, turn to his left, double to the

stretcher, take hold of it, left hand across, resting the near pole on his left hip, return to the patient and place the stretcher directly beneath him (Fig. 82), then stand up and return to his former position, kneel on his left knee, join hands with No. 2, and assist in lowering the patient.

Fig. 82.

8.—**"Lower."**—The patient is lowered slowly and gently on to the centre of the canvas, special care being taken of the injured part (Fig. 83). The bearers then disengage, rise, Nos. 1, 2 and 3 turn to the left, No. 4 to the right, and stand to stretcher;

thus No. 1 with toes in line with front handles, No. 3 with heels in line with rear handles, No. 2 midway between Nos. 1 and 3. No. 4 on the right hand side of the stretcher in line with No. 1.

9.—"**Lift Stretcher.**"—Nos. 1 and 3 stoop, grasp the doubled sling midway between the poles

FIG. 83.

with the right hand and sweep it off the handles, rise, holding it at full length of the arm, buckle to the front. They then take a side-pace between the handles and place the sling over the shoulders, dividing it equally, buckle to the right. The sling should lie well below the collar of the coat behind and in the

hollow of the shoulders in front. They stoop, slip the loops over the handles, commencing with the left, and grasp both handles firmly. No. 4 will then ensure that they rise slowly together lifting the stretcher, No. 3 conforming closely to the movements of No. 1. No. 2 will turn to the left; and No. 4 to the right stepping alongside No. 1.

10.—"Adjust Slings."—No. 2 will turn about (always turn *from a loaded* stretcher—*to* a *closed* stretcher), step forward one pace and adjust the sling of No. 3. No. 4 will turn to the left and adjust the sling of No. 1. Having done this, No. 2 will turn about and step forward one pace; No. 4 will turn to the right. No. 2 will collect any property belonging to the patient and, if practicable, place it on the stretcher.

11.—"March."—The bearers move off: Nos. 1, 2 and 4 stepping off with the left foot, and No. 3 with the right (Fig. 84). The step should be a short one of twenty inches, and taken with the knees bent and without spring from the fore part of the foot.

12.—"Halt."—The bearers remain steady.

13.—"Lower Stretcher."—Nos. 1 and 3 slowly stoop and place the stretcher gently on the ground (No. 3 conforming to the movements of No. 1), slip the loops from the handles and stand up. They remove the slings from the shoulders, hold them as

described in Order 9, take a side-pace to the left, and stand to stretcher. They then place the slings on the handles (as in Order 5) and rise together.

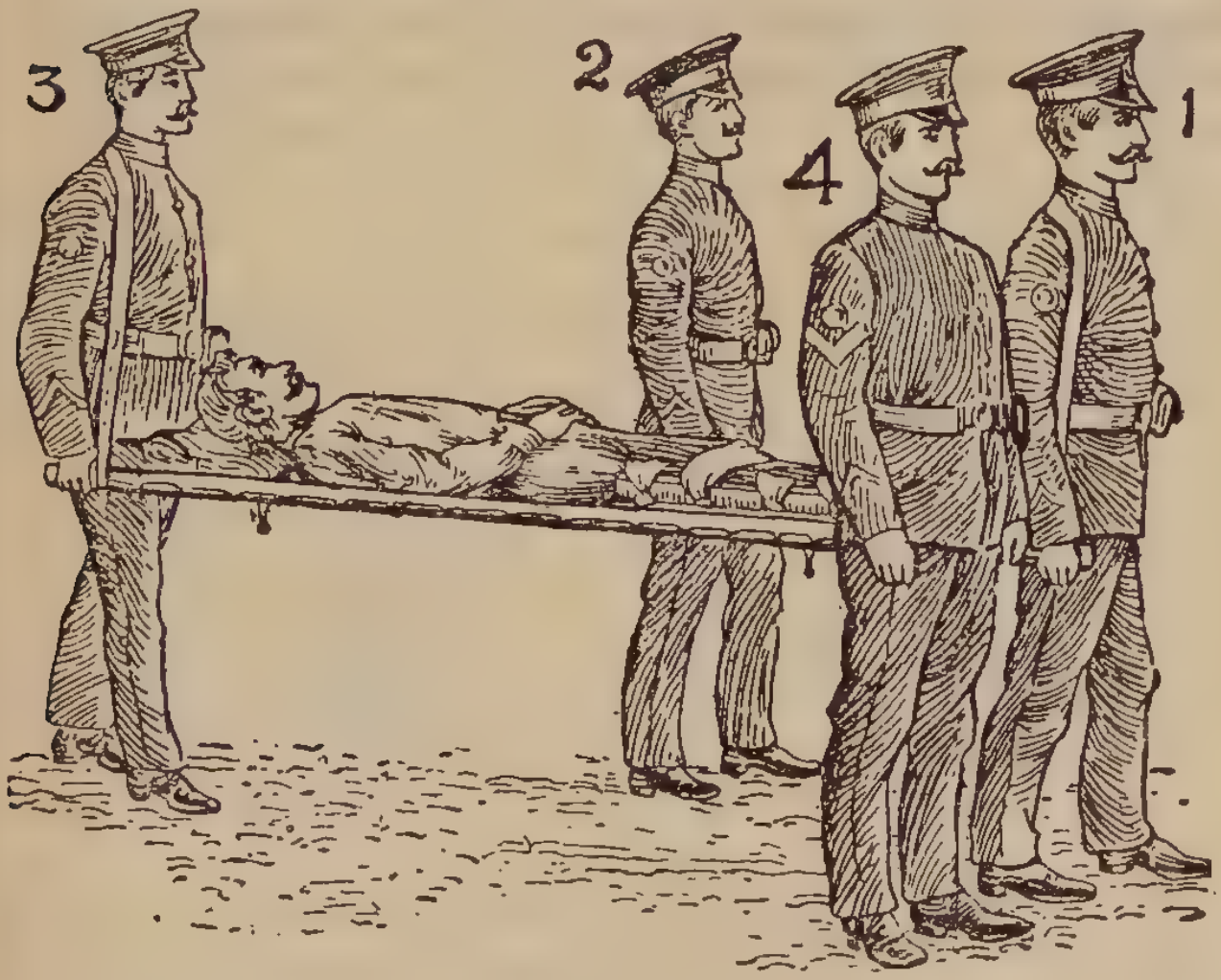


FIG. 84.

14.—"Unload Stretcher."—The bearers will place themselves as described for loading in Order 6.

The patient is lifted as described for loading.

No. 4 grasps the stretcher as described for loading, and, lifting it clear of the patient, carries it forward

three paces clear of the patient's feet. He then rejoins the squad, kneels on his left knee, joins hands with No. 2, and assists in lowering the patient to the ground. The bearers rise and turn towards the stretcher, the whole step off to their places at the stretcher.

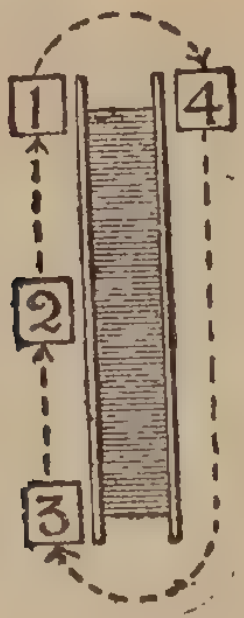


FIG. 85.

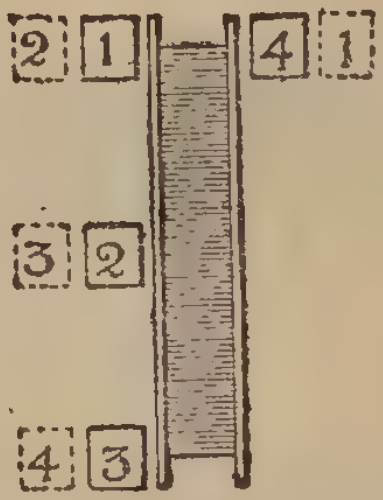


FIG. 86.

15.—"Close Stretcher."—Nos. 1 and 3 turn to the right, kneel on the left knee, remove the slings and place them on the ground beside them, push in the traverses, raise the canvas, and approximate the poles; they then rise, lifting the stretcher, and face one another; place the handles of the poles between their thighs, runners to the right, fold the canvas to the right, lightly on the poles. Each takes up a

sling and passes the buckle end to the other, and holding the buckle end in the left hand, threads the transverse strap through the loop of the other sling, and buckles it tightly close to the runners, keeping the sling on top. Then grasping both handles in the right hand, back of hand to the (original) right, they turn to the (original) right in a slightly stooping position, rise and turn to the left together.

Changing Numbers.

"Change Numbers."—No. 4 will turn about; the whole will step off together, No. 1 wheeling round by the front of the stretcher and taking up the position of No. 4 (Fig. 85). Each man halts in the position of the bearer whose place he has taken. The new No. 4 will turn about, and take command.

N.B.—The figures in dotted squares (Fig. 86) show the new positions of the old numbers.

EXERCISE No. II.

For Three Bearers.

In the event of there being only three bearers available, the stretcher will be placed at the patient's head, in the same line as his body. The bearers will then lift the patient, rise to the erect position, carry him head-foremost over the foot of the stretcher,

the horizontal position of his body being maintained throughout the movement, and lay him in a suitable position on the canvas. When unloading, the patient will be lifted and carried head-foremost over the head of the stretcher. To lift the patient,

FIG. 87.

one bearer, placing himself on the injured side in a line with the patient's knees, raises and supports the lower limbs, while the other two, kneeling on opposite sides of the patient, near his hips, facing each other, each pass an arm under his back and thighs, lock their fingers so as to secure a firm grip and raise and support the trunk. (See Figs. 87 and 88.)

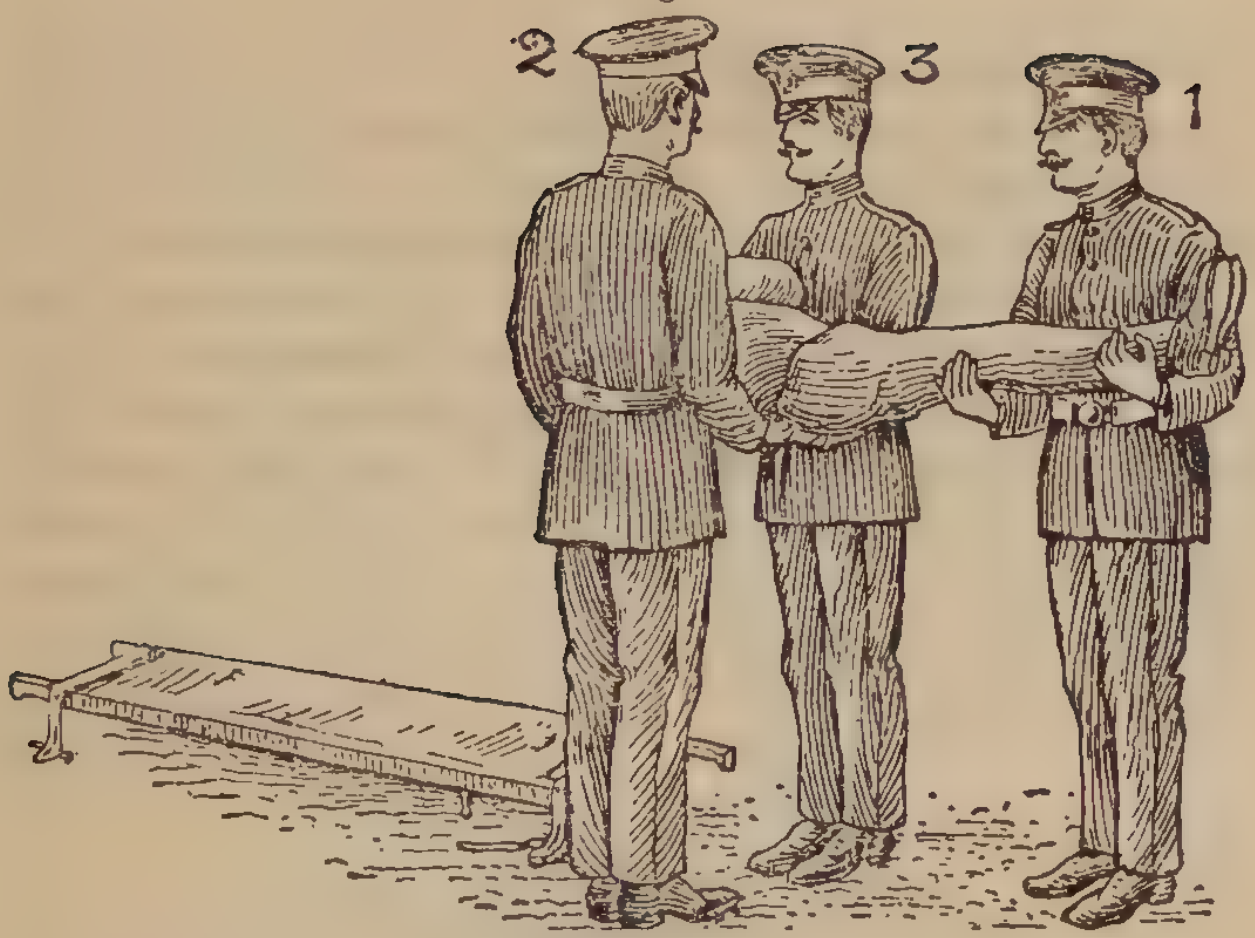


FIG. 88.

EXERCISE No. III.

FOR USE IN MINES AND NARROW CUTTINGS WHERE TWO MEN ONLY CAN BE ENGAGED.

Nos. 1 and 2 will carefully place the stretcher in a line with the injured man's body, the foot of the stretcher being, if possible,* close to his head.

* It is not advisable to be too particular as to the head or foot of a stretcher in a mine, as it would probably be quite impossible to reverse it.

No. 2 places his feet one on each side of the patient between his body and arms, the toe of each foot as near the armpits as possible. He then stoops down and passes his hands between the sides of the chest and the arms underneath the shoulders, and locks the fingers. No. 1 straddles across the patient's legs, placing his right foot, with the toe turned outwards, a little below the patient's knees, and with the toe of the left foot close to the heel of No. 2 ; he then stoops down, passes the left hand under the patient's thighs and the right hand under the patient's calves (Fig. 89). If the patient's arms are unin-

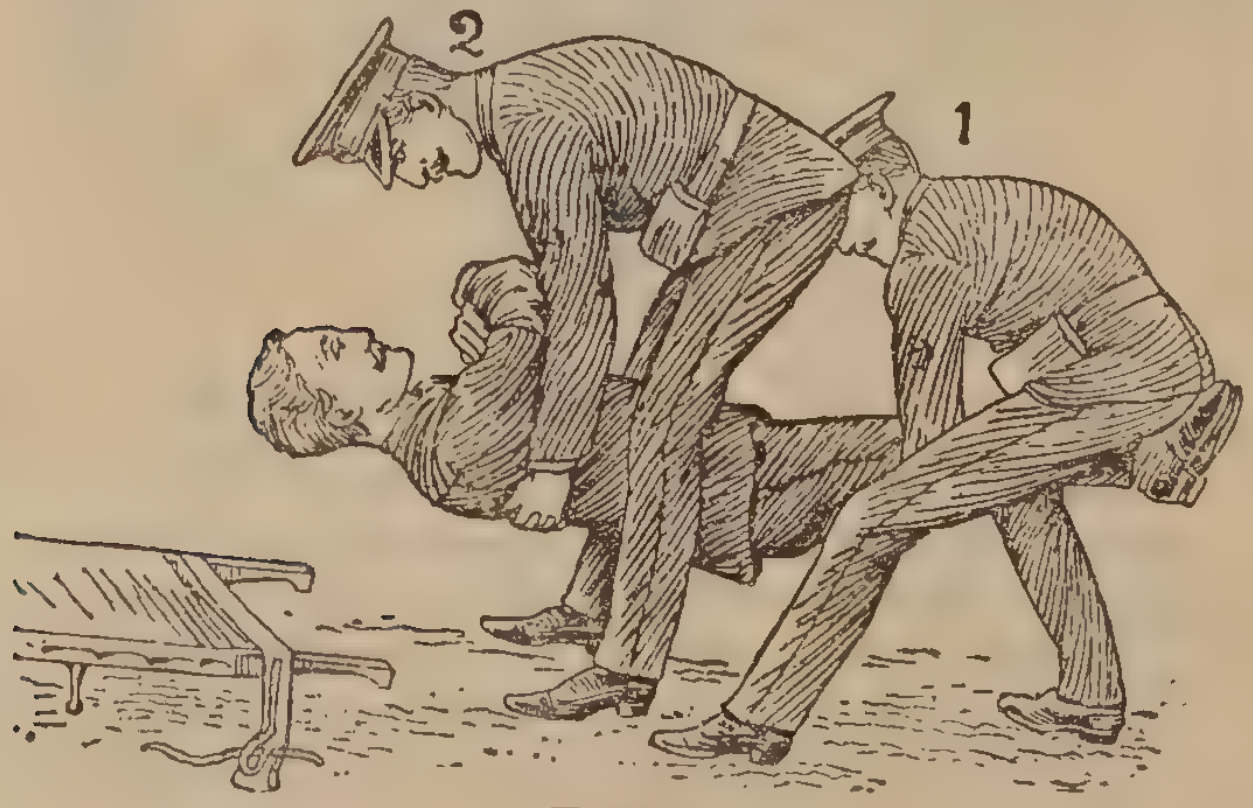


FIG. 89.

jured he may put them round the neck of No. 2, and by this means greatly assist him in lifting.

When both are ready, No. 1 will give the order **"Lift and move forward."** The patient is then to be slowly lifted, just sufficiently to allow his body to clear the stretcher. Both bearers will slowly and gradually move the patient forward, No. 2 by very short steps, No. 1 by bending his body forward as much as he can *without moving his feet* (Fig. 89). No. 1 now gives the order **"Halt,"** whereupon No. 2 remains steady, and No. 1 advances his right foot to his left, and again advances his left foot till the toe

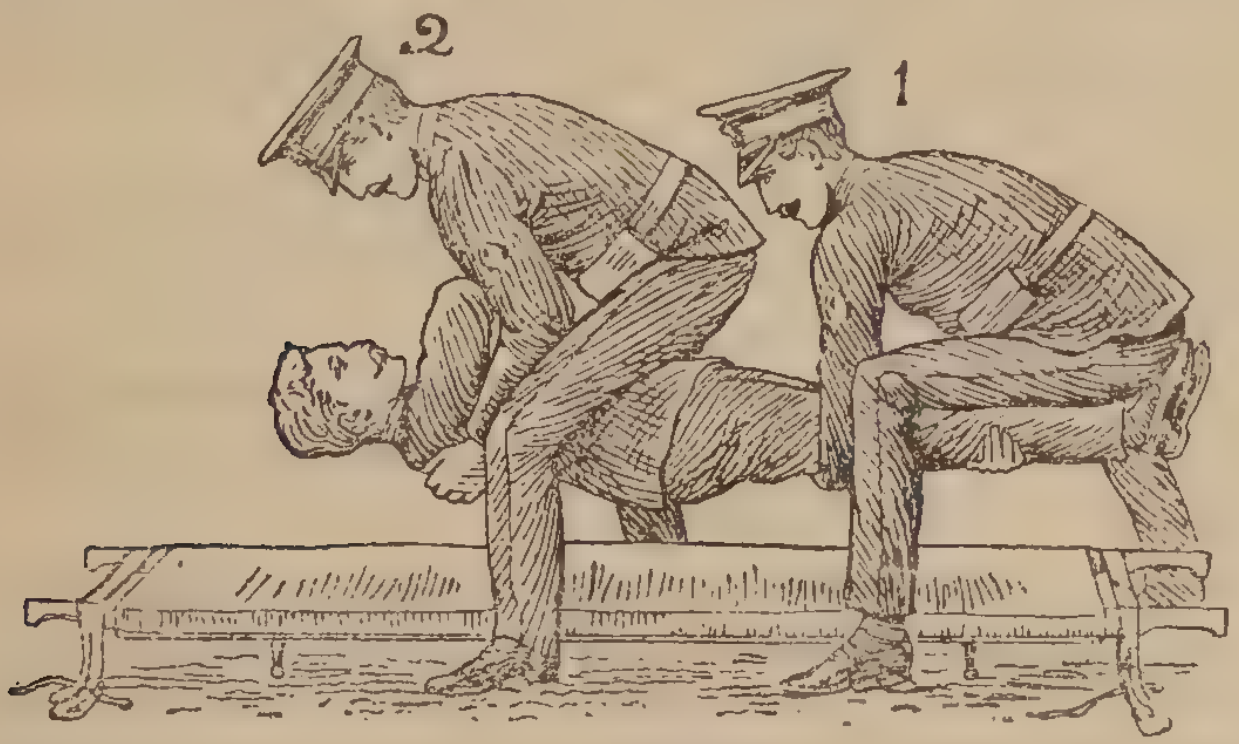


Fig. 90.

touches the heel of **No. 2.** **No. 1** then gives the order "**Advance,**" when the patient will again be moved forward. These movements are to be repeated until the patient is over the stretcher, when he is to be gently lowered (Fig. 90).

Improvised Stretchers.

Stretchers may be improvised as follows :—

1.—Turn the sleeves of two or three coats inside out ; pass two strong poles through them ; button the coats. The poles may be kept apart by strips of wood lashed to the poles at both ends of the bed formed by the coats.

2.—Make holes in the bottom corners of one or two sacks and pass stout poles through them, keeping the poles apart as in 1.

3.—Tie broad bandages at intervals to two poles in the manner described for raising a patient with a fracture of the spine (see page 62).

4.—Spread out a rug, piece of sacking, tarpaulin, or a strong blanket, and roll two stout poles up in the sides. Two bearers stand on each side and grasp the middle of the covered pole with one hand, and near the end with the other. They walk sideways.

5.—A hurdle, broad piece of wood, or shutter may be used; rugs, clothing, hay, straw, etc., should be placed on it, and covered with a piece of stout cloth or sacking; the latter is useful in taking the patient off the stretcher.

Always test an improvised stretcher before use.

Carriage of Stretchers.

As a general rule carry the patient feet foremost.

The exceptions are:—

(*a*) When going up hill with a patient whose lower limbs are not injured.

(*b*) When going down hill with a patient whose lower limbs are injured.

(*c*) When carrying a stretcher upstairs; an extra helper should assist at the lower end, so as to raise it and keep the stretcher nearly horizontal.

To Cross a Ditch.

The stretcher should be lowered with its foot one pace from the edge of the ditch. Nos. 1 and 4 bearers then descend. The stretcher is now advanced, Nos. 1 and 4 in the ditch supporting the front

end while the other end rests on the edge of the ground above. Nos. 2 and 3 now descend. All the bearers now carry the stretcher to the opposite side and the foot of the stretcher is made to rest on the edge of the ground, while the head is supported by Nos. 2 and 3 in the ditch. Nos. 1 and 4 climb out. The stretcher is lifted forward on the ground above, and rests there while Nos. 2 and 3 climb up.

To Cross a Wall.

The stretcher is lowered with the foot about one pace from the wall; the bearers then stand to stretcher, Nos. 1 and 3 on the left, Nos. 4 and 2 on the right. They turn inwards, stoop down, grasp the poles with both hands; they rise slowly, lifting the stretcher, holding it level at the full extent of the arms. Then by side paces advance to the wall, raise the stretcher and lift it on to the wall, so that the front runners are just over the wall. No. 1 then crosses the wall and takes hold of the front handles; No. 4 then crosses the wall, they grasp the poles, lift the foot of the stretcher; all the bearers then advance and lift the rear runners over the wall, resting the rear handles on the wall; No. 3 then crosses the wall and takes hold of the left pole, No. 2 then crosses the wall and takes hold of the right pole. The bearers

then advance until the stretcher is clear of the wall. The stretcher is then lowered to the ground.

To Load an Ambulance.

The stretcher will be lowered with the head one pace from the end of the ambulance.

Nos. 1 and 3 turn to the right, kneel on the left knee, pass the loop of the buckle end of the sling over the near handle, buckle downwards; carry the sling under and round the opposite handle close up to the canvas, back to the near handle, round which two or three turns are made; pass the transverse strap round the pole between the runners and traverse, and fasten the buckle outside the sling between the poles. The bearers then rise and stand to stretcher.

The bearers will now take up their positions as follows:— Nos. 1 and 3 on the left, 2 and 4 on the right. No. 2 opposite to No. 3, at the head.

"**Load.**"—The bearers turn inwards, stoop, grasp the handles of the stretcher, hands wide apart, palms uppermost; they rise slowly, lifting the stretcher, holding it level at the full extent of the arms. They then take a side pace to the ambulance, lift on to a level with its floor, place the runners on it, Nos. 1 and 4 slightly raising the foot. The stretcher is then gently pushed into its place, Nos. 2 and 3 making way for the stretcher to pass between them.

Many ambulances are provided with upper and lower berths. In such cases the upper berths should be loaded first, beginning on the off side.

To Unload an Ambulance.

Nos. 1 and 4 will take hold of the handles at the foot and gently withdraw the stretcher. As it is withdrawn, Nos. 2 and 3 will take hold of the handles at the head, and taking the weight, lower it to the full extent of the arms, then by side paces march clear of the ambulance ; lower the stretcher to the ground.

Lifting into Bed.

Place the stretcher at the side of the bed. The bearers to take positions as in Stretcher Exercise No. I, Nos. 1, 2 and 3 being on the side furthest from the bed. The patient to be unloaded on to the knees of Nos. 1, 2 and 3, as in Exercise No. I, but if the bearers must go to the right side of the patient, they must kneel on their right knee. No. 4 will disengage, remove the stretcher (this can be done by pushing it under the bed). No. 4 then joins hands with No. 2. All the bearers rise to a standing position, supporting the patient on their forearms. No. 4 disengages and goes to the patient's head. All bearers then step forward and gently place the patient on the bed.

Or, if the bed is narrow, and there is room, the stretcher may be placed on the floor with the head close to the foot of the bed. The injured person may then be lifted over the foot and placed on the bed.

The first method is preferable.

QUESTIONS ON CHAPTER XV.

The numerals indicate the pages where the answers may be found.

	PAGE
How may an injured person be removed to shelter ?	179
What will the method depend upon ?	179
What principles of transport must be kept in mind ?	179
What are the methods of carrying when only one bearer is available ?	180
What are the methods of carrying when two or more bearers are available ?	180
Demonstrate the two-, three-, and four-handed seats	180, 186, 188
Explain when they are used..	180, 186, 188
Describe the ordinary stretcher	190
How may a stretcher be improvised ?	206
What should always be done before using an improvised stretcher ?	207
State the general rule and exceptions for carriage of a stretcher	207

Chapter XVI.

PREPARATION FOR RECEPTION OF ACCIDENTS.

1.—Select room.—Choose one which is easy of access, on the ground floor if possible. It should be large and airy and provided with a fireplace to ensure efficient ventilation. In private houses the choice is necessarily limited, but one with a cheerful sunny aspect is desirable. The patient's own room is the best if it fulfils these requirements.

2.—Clear passage and staircase of furniture and mats so far as possible.

3.—Prepare the bedroom.—Light the bedroom fire and remove all unnecessary furniture. Place the bed so that both sides are easy of access.

4.—Prepare the bed.—A single bedstead with a firm mattress (not a feather bed) should be used. If the patient has sustained a fracture of the spine, pelvis or lower limb place transverse boards under the mattress, and have ready a bed-cradle.

Remove the upper bedclothes, place a mackintosh or waterproof in the bed, and a draw-sheet on that portion of the bed on which the injured part will lie. Over this place a temporary blanket or sheet, aprons, brown paper or even newspapers, to keep the bed

clean until the soiled clothing is removed and the patient has been attended to by the doctor.

Place hot bottles or hot bricks covered with flannel in the bed.

5.—Prepare for collapse.—Have ready hot blankets, tea, coffee and other stimulants.

6.—Have ready for the doctor a small easily moved table, basins large and small, plenty of hot and cold sterilised water, soap, nail brush, towels, cotton wool, pins, scissors, a pail to receive the dirty things, and any dressings and antiseptics available.

7.—Clean clothing for the patient should be airing by the fire, and extra bedclothes and pillows in case they should be needed.

QUESTIONS ON CHAPTER XVI.

The numerals indicate the pages where the answers may be found.

	PAGE
What would you consider when choosing a sick room ?	212
How would you prepare the way to the sick room ?	212
How would you prepare the bedroom ?	212
How would you prepare the bed ?	212
How would you prepare for collapse ?	213
What would you have ready for the doctor ? ..	213
What would you have ready for the patient ? ..	213

(The following appendices are not included in the Syllabus of the First Aid Course.)

Appendix I.

THE ROLLER BANDAGE AND ITS APPLICATION.

The Roller Bandage.

Roller bandages are made of woven cotton, domette, flannel, etc., of various widths for different parts of the body and are usually 6 yards in length. Any suitable material cut into strips of the required width and length may be used if roller bandages are not available. They may be rolled by hand or by means of a machine (Fig. 91). When a bandage is partly unrolled the roll is called the head, and the unrolled part the free end.

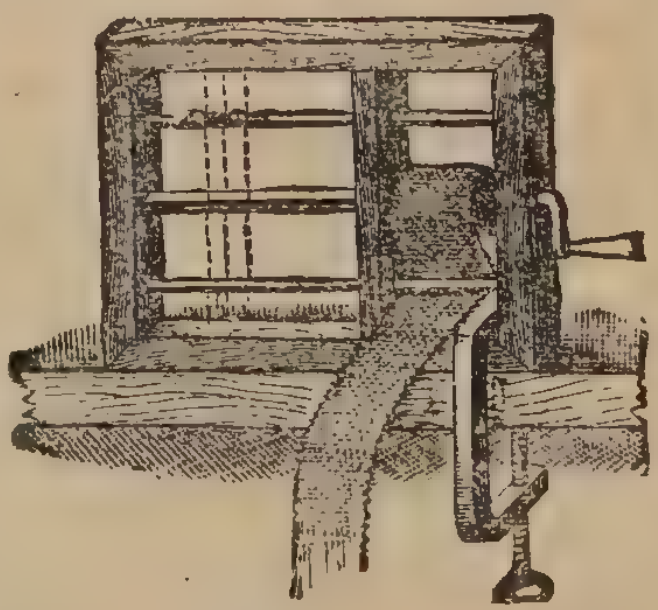


Fig. 91.

Uses of the Roller Bandage.

Roller bandages are used :—

1. To retain splints or dressings in position.
2. To afford support.
3. To make pressure and so reduce or prevent swelling.
4. To drive blood from the part of the body bandaged, as in the case of extreme collapse from hæmorrhage.

General Rules for Application.

1. See that the bandage is tightly and evenly rolled before attempting to use it.
2. Apply the outer side of the free end to the part.
3. Never allow more than a few inches of the bandage to be unrolled at a time.
4. Bandage from below upwards, and from within outwards.
5. Each layer of the bandage should cover two-thirds of the preceding one.
6. Apply the bandage firmly and evenly, but not tightly enough to stop the circulation. If the edges turn up on passing the hand over them, the bandage is too loose. If, after the bandage is taken off, red lines are seen, it has not been evenly applied.
7. When the bandage is finished, fix it securely.

Methods of Application.

There are three principal methods of applying the roller bandage :—

1. **The simple spiral,** which is made by encircling the part with the bandage several times.

This method should only be adopted when the part to be bandaged is of uniform thickness, as, for instance, the finger, or wrist and a short portion of the forearm above it.

2. **The reverse spiral,** which is made by a number of spiral turns in which the bandage is reversed upon itself at each circuit of the limb.

This is used in bandaging parts of the limbs where owing to their varying thickness it is impossible to make a simple spiral lie properly. (See Fig. 95.)

3. **The figure of 8,** which is applied by passing the bandage obliquely round the limb, alternately upwards and downwards, the loops resembling the figure 8.

It is used for bandaging at or in the neighbourhood of a joint such as the knee or elbow. It may also be used instead of a reverse spiral for a limb.

For bandaging the shoulder, groin or thumb, a modified figure 8 known as the **spica** is used. (See Figs. 93 and 94.)

Typical Bandages Described.

For the Fingers.—*Width of bandage*, $\frac{3}{4}$ or 1 inch. *Course.*—From inner to outer side of front of wrist, a sufficient length being left for tying; across back of hand to inner side of finger to be first bandaged (bandage the fingers in order from the little finger side), by one spiral to root of finger nail; round finger by simple (or if necessary reverse) spirals; thence to root of little finger and round wrist. Tie to free end left for the purpose, or continue to the next finger. (Fig. 92.)

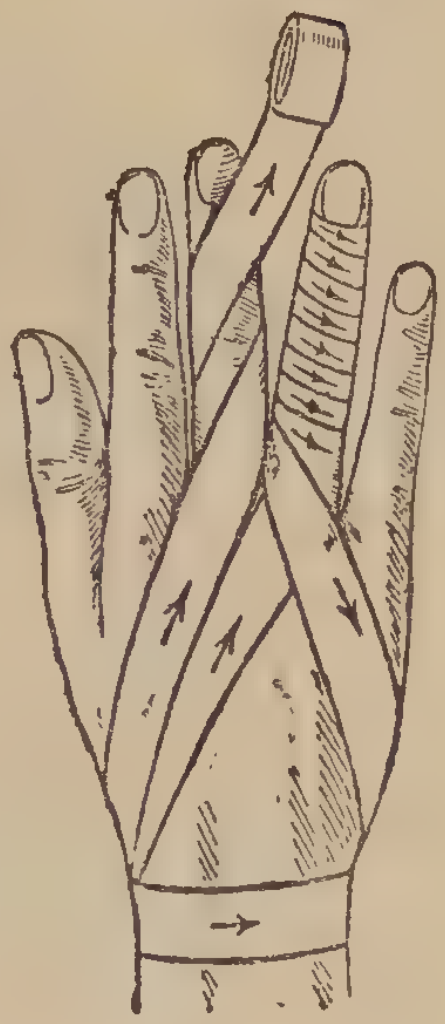


Fig. 92.

Spica for the Thumb.—*Width of bandage*, 1 inch. *Course.*—Across front of wrist from inner to outer side; up between thumb and finger; simple turn round thumb; diagonally across back of thumb and hand to wrist; across palm and round

thumb and continue until the thumb is covered. Finish by a turn round wrist and secure. (Figs. 93 and 94.)

FIG. 93.

FIG. 94.

Reverse Spiral for the Forearm.—*Width of bandage*, 2 or 2½ inches. *Course.*—Across front of wrist from inner to outer side; across back of hand to first joint of little finger; across front of

fingers; to inner then outer side of wrist. Repeat once.

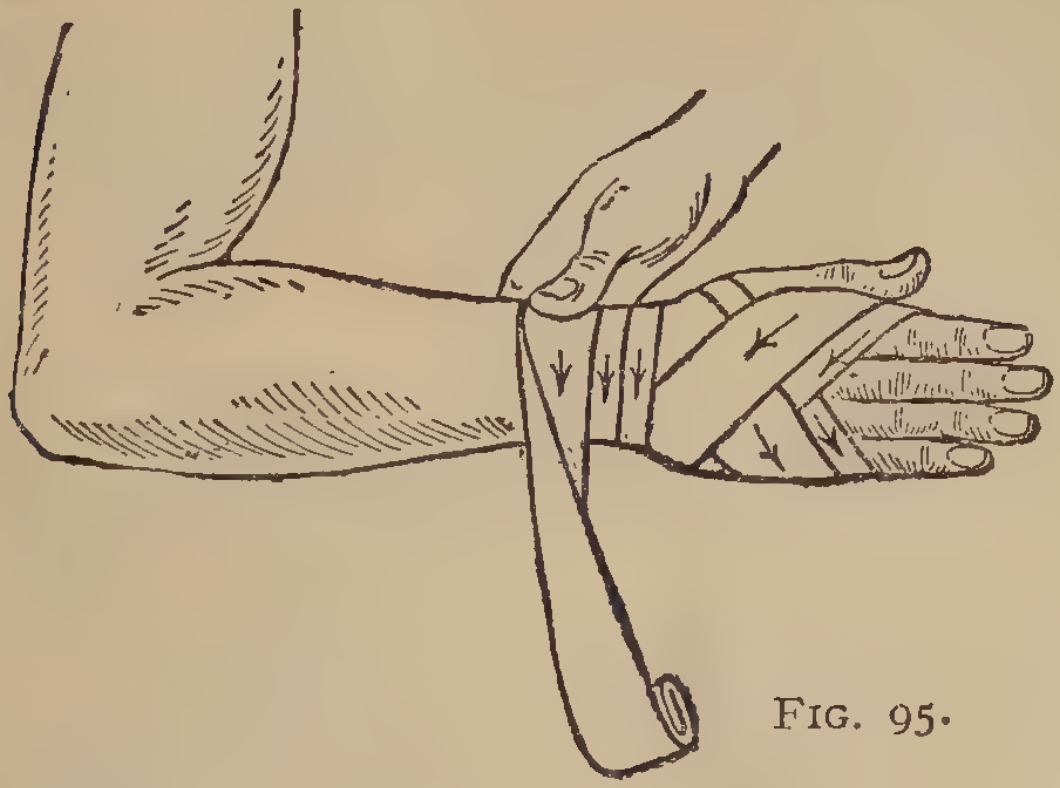


FIG. 95.

FIG. 96.

Two or three simple spirals round wrist. Reverse spirals on forearm. (Figs. 95 and 96.)

The figure of 8 bandage, as for the leg, may be applied instead of the spiral.

Spica for (right) Groin.—*Width of bandage,* 3 inches. *Course.*—Two turns round the thigh to fix the bandage. Fork to crest of right hip ; across loins to left hip ; thence to outer side of and behind right thigh. Repeat until the groin is sufficiently covered. (Figs. 97 and 98.)

FIG. 97.

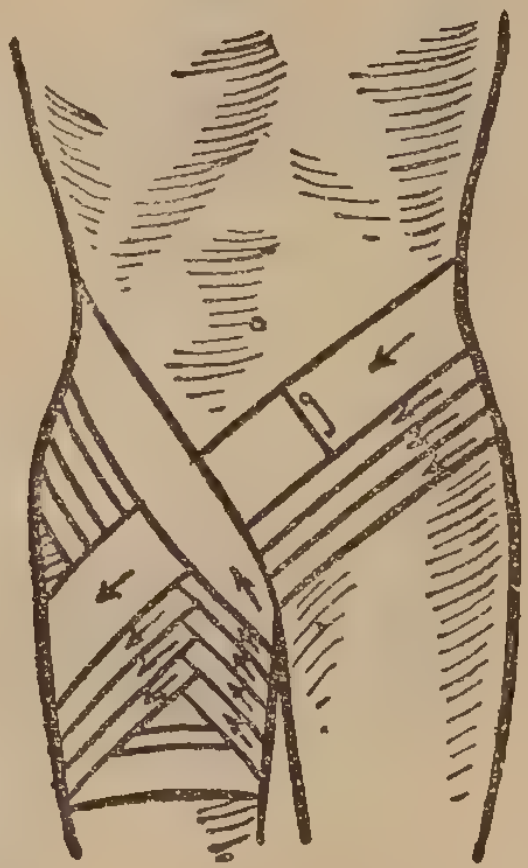


FIG. 98.

Figure of 8 Bandage for the Elbow, Knee and Ankle.

Width of bandage, 3 inches. *Course.*—Round the joint and then alternately above and below. (Figs. 99 and 100.)

FIG. 99.

FIG. 100.

Figure of 8 Bandage for the Leg.—*Width of bandage*, 3 inches. *Course.*—From inner side of ankle to outer side of foot, round foot; round ankle; again round foot and ankle; and thence up the limb by ascending figures of 8, each layer covering the previous one by one-half. (Fig. 101.)

The reverse spiral, as for the forearm, may be applied instead.

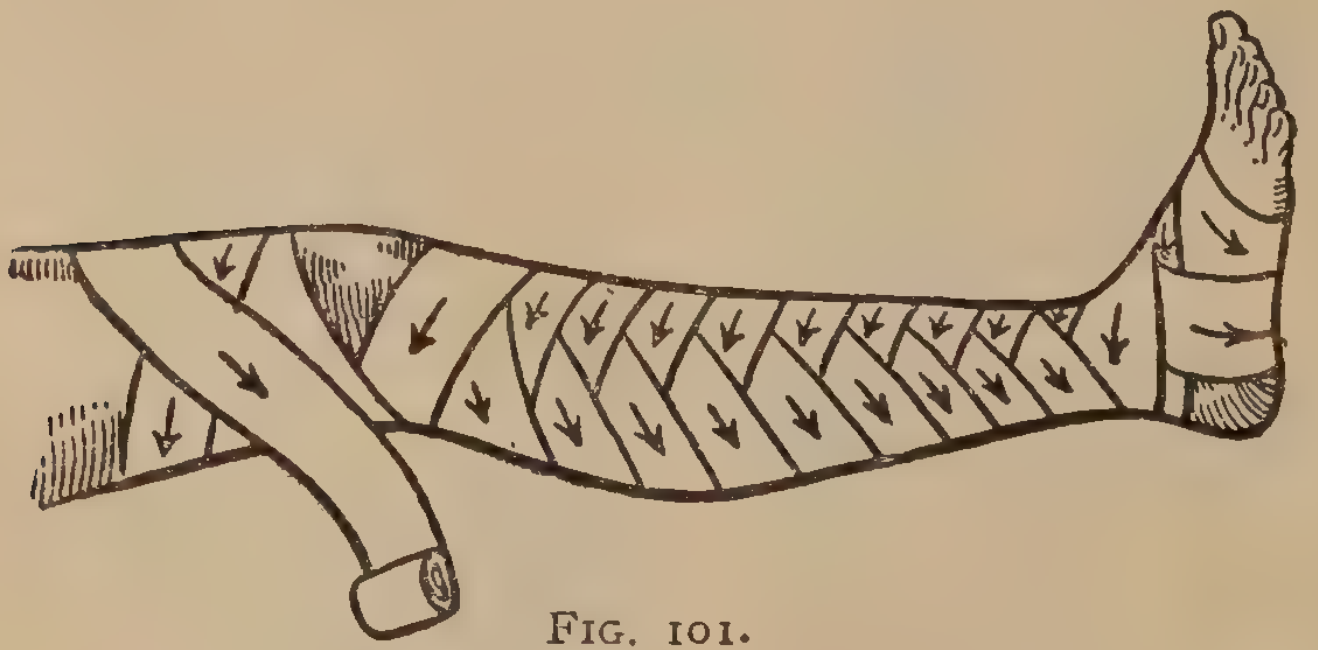


FIG. 101.

MANY-TAILED BANDAGES.

These bandages may be made of domette, flannel, linen or other suitable material.

The chief advantage of the many-tailed bandage is that a wound can be examined or a dressing changed without undue disturbance of the patient. (Fig. 102.)

A piece of material long enough to go one and a half times round the limb, and in width sufficient to cover the dressing on the wound may be torn from each end in parallel strips of equal width towards the centre, which remains undivided: the strips must be equal to each other in width, which will vary from 2 to 4 inches according to the part to be bandaged.

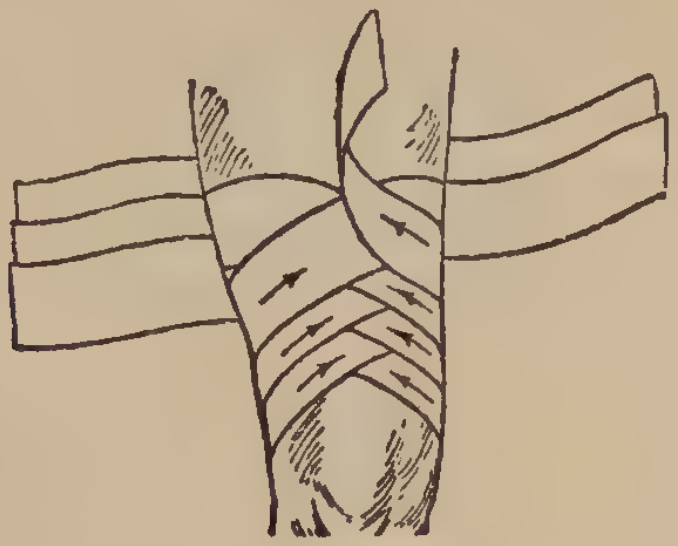


FIG. 102.

An alternative method of making the many-tailed bandage is to lay strips of suitable material parallel to each other, each overlapping one-third of the preceding one: the strips may then be sewn together for a short distance on either side of their centres or to a similar piece of material laid across the centres of the strips.

Appendix II.

SILVESTER'S METHOD OF ARTIFICIAL RESPIRATION.

This method is useful when it is inexpedient or impracticable to turn the patient on to his face.

1.—Adjust the patient's position.—Without wasting a moment, place the patient on his back on a flat surface, inclined if possible from the feet upwards. Undo all tight clothing. Raise and support the shoulders on a small, firm cushion or folded article of dress placed under the shoulder-blades.

2.—Maintain a free entrance of air into the windpipe.—An assistant must draw forward the patient's tongue as far as possible, and hold or secure it in that position. If this is not done there is great danger of obstruction of the windpipe by the tongue falling back over the top of it (compare Figs. 61 and 62, p. 139).

3.—Imitate the movements of breathing.

(*a*) *Induce Inspiration.*—Kneel at a convenient distance behind the patient's head, and, grasping his forearms just below the elbows, draw the arms upwards, outwards, and towards you, with a sweeping movement, making the elbows touch the ground

(Fig. 103). The cavity of the chest is thus enlarged, and air is drawn into the lungs.

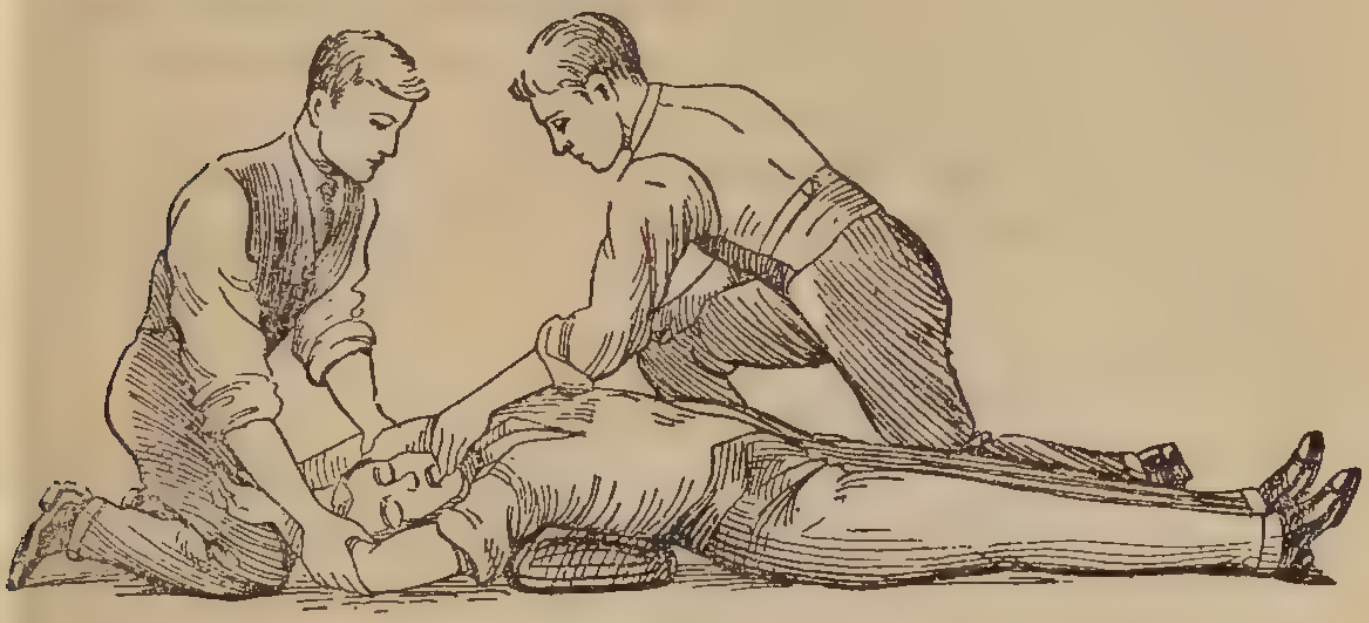


FIG. 103.—INSPIRATION.

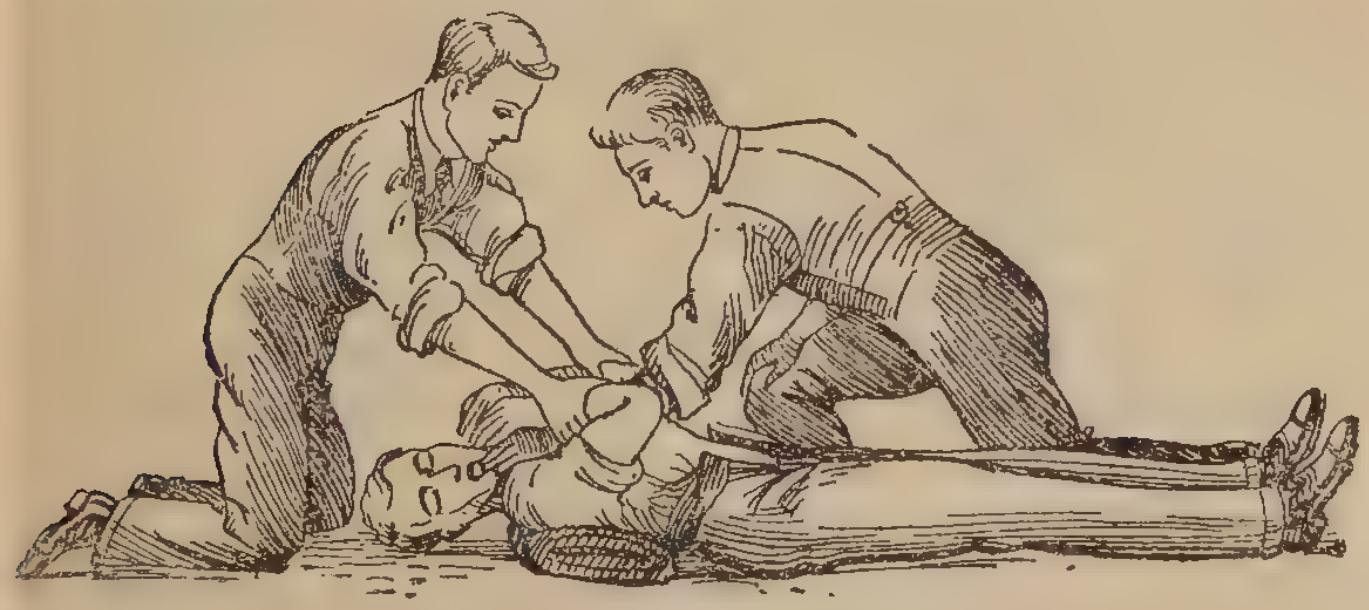


FIG. 104.—EXPIRATION.

(*b*) *Induce expiration.*—Bring the patient's flexed arms slowly forwards, downwards and inwards, press the arms and elbows firmly on the chest on each side of the breast-bone (Fig. 104). By this means air is expelled from the lungs.

(*c*) *Repeat* these movements alternately, deliberately, and perseveringly about twelve to fifteen times a minute.

Appendix III.

THE THOMAS SPLINT.

INTRODUCTORY.

This splint is named not after the famous hospital in London, but after the eminent surgeon, the late Mr. H. O. Thomas.

It was used extensively during the Great War and was the means of saving many lives and much suffering. Indeed it has been written that it was the "only splint which was found of universal and inestimable value" in the War. The same writer has criticised the St. John Ambulance Association for making no mention of the Thomas Splint in its manual; but he overlooks the fact that while at least two and possibly three first aiders, trained to

work together, are required for the correct and convenient application of the splint, the manual of the Association deals primarily with "casual" first aid rendered by an individual with improvised material, as distinct from "organised" first aid as practised by a first aid unit trained to work together and equipped with suitable appliances.

The application of the Thomas Splint is included in the syllabus of training of Voluntary Aid Detachments, and a knowledge of its use will be of value to members of the other Technical Reserves for the Medical Services of the Forces of the Crown found by the St. John Ambulance Brigade, namely, the Royal Naval Auxiliary Sick Berth Reserve and the Military Hospitals Reserve, and also to other trained first aiders who have opportunities for practising and working together in parties which are equipped with the necessary appliances and have not to rely upon improvisation. For this reason instruction in the use and application of the splint is included in the manual, not as part of the syllabus of the first aid course, but as an Appendix.

Uses of Splint.

The splint may be used (a) for all fractures of the thigh-bone except where there is an extensive wound

in the upper part of the thigh or buttock against which the splint would press and cause pain ; (b) for any fracture about the knee-joint and bones of the leg ; (c) in certain cases of extensive wounds of the fleshy part of the leg or thigh.

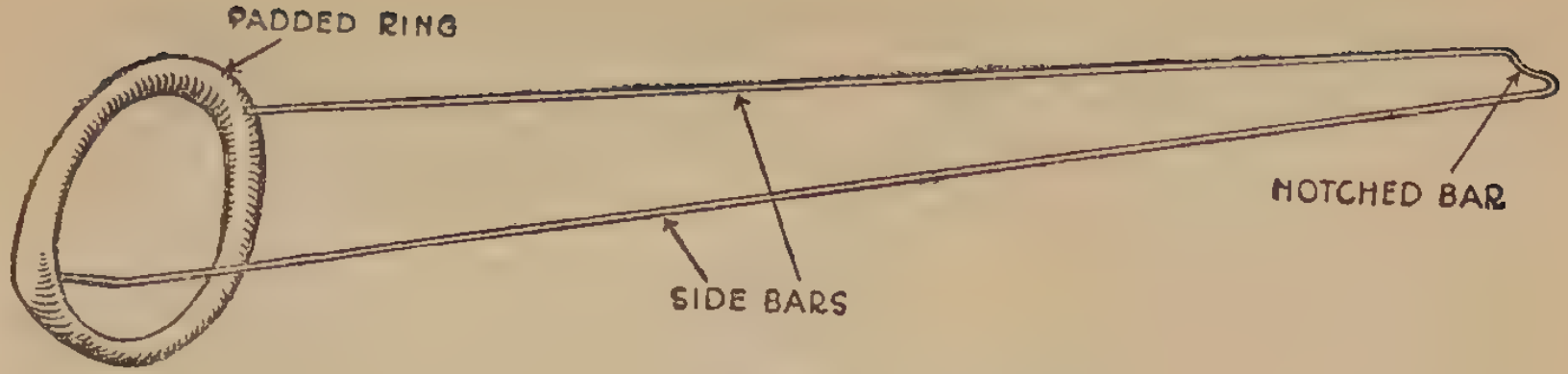
Outfit.

For practising the application of the splint the following outfit is desirable :—

Thomas Splint.
3 blankets.
2 flannel bandages, each 6 yards by 3 inches.
4 triangular bandages.
Dressings.
Safety pins.
Gooch splints, 10 by 6 and 8 by 6 inches.
Suspension bar (which is supplied with the splint).
Sinclair reversible stirrup.
Stick or 6 inch nail for Spanish windlass.
Stretcher. (Trestles on which the stretcher may be placed are convenient in practice).

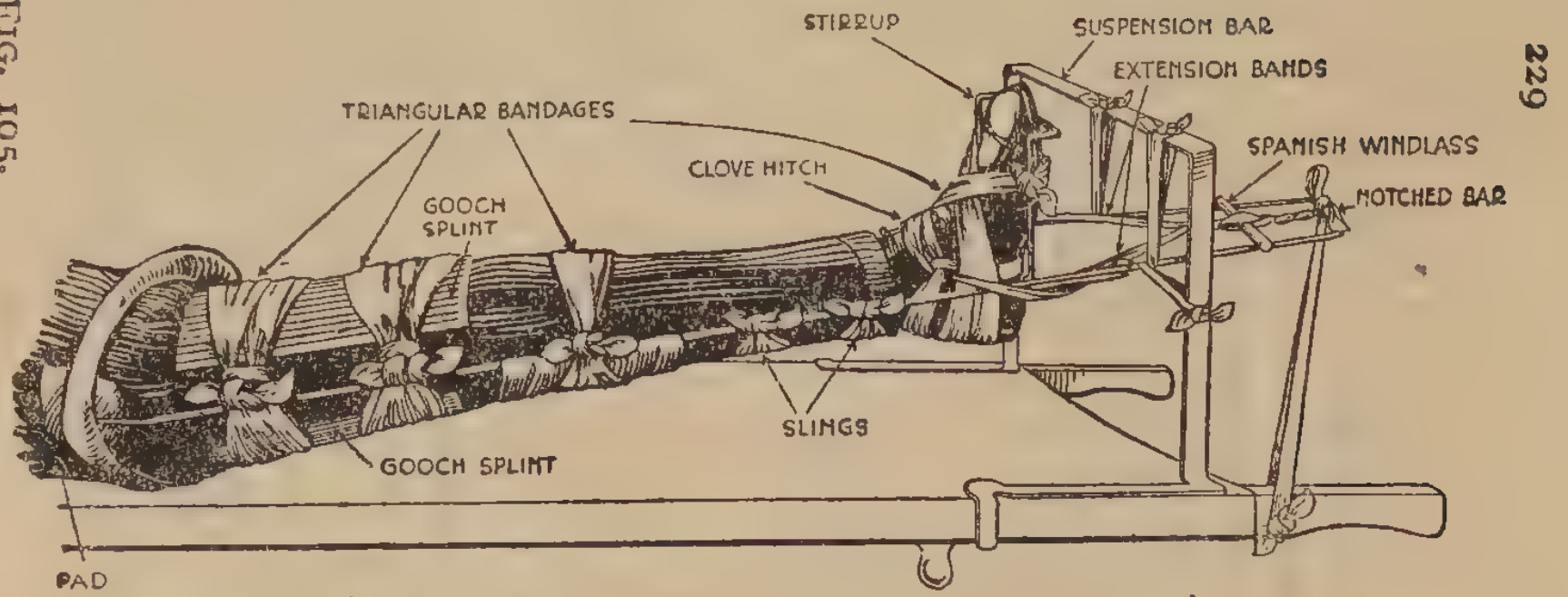
Personnel.

A team for the purpose of practice usually consists of four first aiders, who may be numbered 1, 2, 3, and 4, and a patient ; but three or even two are sufficient.



THE THOMAS SPLINT.

FIG. 105.



THE THOMAS SPLINT APPLIED (RIGHT LEG).

Drill.

The application of the Thomas Splint can most conveniently be taught as a drill.

1. **Prepare Stretcher.**—Nos. 2 and 4 proceed to the patient and cover him with a blanket: Nos. 1 and 3 prepare the stretcher and fold each of two blankets lengthwise into three and place them with a double fold along the bed of the stretcher; there are thus four folds of blanket on the bed of the stretcher: the third folds hang down on either side.

2. **Hand Extension.**—No. 2 places himself at the foot of the patient facing him and opposite the injured limb. Keeping the arms straight, he grasps the heel of the boot with his right hand and the toe with his left, and, keeping the foot vertical, exerts a steady pull. No. 3 steadies and supports the injured limb above and below the seat of fracture.

3. **Apply Splint.**—No. 4 threads the ring of the splint over the boot (pointed end of ring outwards), No. 2 removing and re-applying each hand in turn to permit of this being done: while No. 3 continues to support the limb at the seat of fracture, No. 4 passes the splint up the limb until its further passage is stopped by the buttock. The notched bar must be kept horizontal.

4. **Clove Hitch.**—No. 1 takes three yards of flannel bandage and makes a clove hitch in such a way as to leave one end about six inches longer than the other and a loop about ten inches in diameter. This loop is applied over the boot with the ends on the outer side of the ankle: to allow of this being done No. 2, still carrying out hand extension, again removes and re-applies one hand at a time. The long end of the bandage is taken under the instep of the boot, up on the inner side of the ankle, threaded through the loop of the hitch and turned down outside the loop. These two ends of the bandage, one on either side of the ankle, are for use as extension bands when permanent extension takes the place of hand extension.

5. **Fix Leg.**

(a) The extension bands are tied round the notched bar as follows:—the outer extension band is passed over and under the bar, round the notch, drawn taut, and held over to the opposite side. The inner band is passed under and over the bar, then also round the notch, so that it crosses the first band and prevents it slipping. The two are tied off by a half bow. No. 2 may now release his hold.

(b) The notched bar is now placed on some object, such as an empty petrol tin turned on its side, so

as to keep the limb well raised from the ground. No. 3 will continue to steady and support the limb.

(c) The knee, slightly bent, is supported by a broad bandage fixed between the side bars of the splint as follows :—thread a bandage over the outer splint bar at the level of the knee so that its equal ends hang downwards on either side of the bar ; pass the two ends under the knee and bring one end over and the other under the inner splint bar and tie off tightly. Bring one end back over the knee and the other end back under the knee and tie off on the outer side of the bar. The knee being thus supported No. 3 relinquishes his support.

(d) The limb is further supported in shallow troughs or slings made by the flannel bandages fixed to the side bars below the ankle and calf so that the middle line of the leg is at a level with the side bars of the splint.

The limb is now firmly fixed in a position of extension and may be moved without causing damage to the injured part or pain to the patient, who may now be placed on the stretcher.

6. **Dress Wound.**—A wound, if present, is dressed in accordance with the general rules.

7. **Gooch Splints.**—These or other well-padded cardboard splints may be applied (over the dressings,

if any), the short piece behind and the long piece in front of the thigh, care being taken to avoid pressure on the knee-cap. Two slings, as in 5 (d) above, are tied under the short piece and both splints are kept firmly in position by two narrow bandages carried round the thigh and up outside the splint bars.

8. **Stirrup and Figure of Eight.**—The stirrup is sprung on to the splint (care being taken to keep it clear of the extension bands) and pressed upwards until the horizontal bar rests lightly against the sole of the boot, thus preventing lateral movement of the foot. A narrow bandage is passed under the heel, the ends coming inside the extension bands: the ends are crossed over to make a figure of eight turn round the instep and firmly tied on the outside vertical bar of the stirrup, thus supporting the heel and fixing the foot in the required position.

9. **Spanish Windlass.**—Except in the case of a compound fracture when the bone protrudes, the extension bands are tightened and a small piece of wood or a nail may be introduced to increase the tension by twisting up as required.

10. **Pad in Ring.**—A pad of cotton wool is inserted between the ring and the thigh to act as a wedge and so prevent undue movement.

11. **Suspension Bar.**—This is fitted to the stretcher with the grips away from the ratchets.

The splint is slung about three inches from the horizontal iron of the suspension bar by bandages tied to the splint bars. It is also tied to the vertical irons of the suspension bar to prevent lateral movement ; and finally to the nearer handle of the stretcher to prevent vertical movement.

12. **Cover Patient.**—Hot water bottles are applied and the patient is covered first by the blanket (with which he was originally covered) folded lengthwise in two, and finally by the two folds (hanging from the stretcher) which are brought up over him and pinned. There are thus four thicknesses of blanket over and four under the patient.

The patient is now ready for removal to shelter.

Appendix IV.

FIRST AID AND AMBULANCE AT FACTORIES AND WORKSHOPS.

At the request of the Factory Department of the Home Office, and to assist in making known the several very important First Aid Orders issued by the Home Office under the "Police, Factories, &c. (Miscellaneous Provisions) Act, 1916," the following slightly condensed extract from the official

pamphlet, "First Aid and Ambulance at Factories and Workshops," is affixed to the Association's text book for the First Aid course of instruction.

Organization.

If the full benefits of First Aid and Ambulance are to be obtained, their organization must be carried out in such a manner as to ensure the co-operation of the workers. There is no side of industrial life where the interests of employers and employed are more closely identified, and where combined efforts towards improvement work more for mutual benefit.

Supervision is essential, and some person or persons must be made responsible for the smooth and satisfactory working of the organization throughout the factory, and as First Aid is so closely allied with safety, it would seem appropriate to delegate to members of any Safety Committee established at the works, the responsibility for the efficient carrying out of First Aid and Ambulance arrangements. To this Committee would fall the duties of considering suggestions regarding the adequacy of the provision made. It would also undertake arrangements for the training of persons in First Aid and the appointment of an appropriate number of them to be responsible for the First Aid Boxes.

The benefits of an effective First Aid and Ambulance service may be summarised as follows :—

Suffering is alleviated.

The workman who has met with a slight accident is enabled to return to work almost immediately in comfort and with a sense of security.

Minor accidents are prevented from developing into serious injuries as a result of septic infection or blood poisoning. Experience shows that it is not always a severe accident that in the end proves the most serious.

The loss of a limb or even of life has ensued from an apparently trivial, but neglected, injury.

The recovery of the workman and his return to work after a severe accident may be materially expedited.

The Home Office has statutory power to make Orders requiring the provision of Ambulance and First Aid arrangements at any specified works or class of works, and several Orders for different classes of work are already in force. These Orders differ somewhat according to circumstances, but are based on one general scheme comprising :—

1. First Aid Boxes.

(*a*) For the treatment of minor injuries.

(*b*) For preliminary treatment of more serious cases, *e.g.*, hæmorrhage, fractures,

unconsciousness, etc., before medical help is available.

2. **Central Ambulance Room** under the charge of a qualified nurse or other person trained in First Aid. This will be the main centre of treatment in the works, serving in particular for the preliminary treatment of the more serious cases and also for any subsequent treatment that may be required in cases dealt with at the First Aid Boxes.

First Aid Boxes.

Number and Position of First Aid Boxes.—It is essential that First Aid to be successful shall be rendered immediately, and First Aid Boxes should therefore be provided in such numbers and positions as to be within easy reach of every worker. The Home Office Orders prescribe a minimum number, which is one box to every 150 persons. The best position for a First Aid Box is in the workroom itself.

Equipment of First Aid Boxes.—The equipment of the First Aid Boxes as specified in the Orders varies according to the nature of the injuries likely to occur in the particular industry or process, but, generally speaking, it consists of a supply of sterilised finger, hand and large size dressings, iodine solution,

a bottle of eye drops and sterilised cotton wool, together with a copy of the First Aid leaflet issued by the Factory Department, which gives suggestions for the treatment of minor injuries. *It is best that the equipment of a First Aid Box should in most cases be limited to the articles above specified;* cases have been brought to the notice of the Factory Department where boxes have been supplied with equipment of a quite unnecessarily elaborate character. Where, however, no ambulance room is provided, it is desirable to provide in one or more of the boxes or in a small cupboard in a central position the following additional appliances: scissors, safety pins, sal volatile and measure glass, a tourniquet, splints, slings, roller bandages, an additional supply of wool and a roll of plaster (1 inch wide), and also, in places where burns are likely to occur, a supply of sterilised burn dressings. A stretcher is also advisable.

Protection and Use of Dressings.—Dressings must be sterilised (subjected to heat to destroy any germs, and not merely impregnated with an antiseptic), but must also be kept sterile. Each dressing should therefore be in a separate packet carefully sealed, complete in itself, and so packed that it will not matter whether or not the hands of the worker who applies it are dirty. All that is necessary is to

avoid touching that part of the dressing which is to be placed upon the wound.

Waterproof Plaster.—Waterproof plaster to cover dressings is required in Dyeing and Tanning Works where solutions of bichromate of potassium are used, in order to prevent the solution in which the worker's hands are immersed from saturating the dressings and attacking the wound. To be successful the plaster must be applied so that it overlaps the edges of the dressing underneath to an appreciable extent.

Washing of Wounds should not be done, but iodine solution should be applied by using sterilised swabs. These should be used once only and thrown away.

Burns.—The immediate application of a dressing is important in the case of a burn, as the immediate exclusion of air alleviates pain. The sterilised wool in the box can be used for this purpose, but special burn dressings consisting of lint impregnated with picric acid, are included in the outfit in cases where burns are likely to occur. The use of oil and grease should be avoided. When the burn is caused by a strong acid or caustic, the burn should be thoroughly flooded with water before using the sterilised dressing.

Injuries to the Eye.—Two kinds of injury have to be provided for.

(*a*) The presence of a foreign body.

The only First Aid permissible for this is to brush the eye gently with a brush carrying a little of the No. 1 solution mentioned in the First Aid leaflet, so that pain is relieved and the foreign body if possible brushed from the eye. Any further treatment must be given by a doctor, and no attempt should be made to remove the foreign body by any other means.

(*b*) A burn caused by splashes of acids or caustics.

In this case the eye must be thoroughly washed out with sterilised water, after which some drops of No. 2 solution mentioned in the First Aid leaflet should be dropped into it.

No injury to the eye should be neglected, whether it appears serious or not.

Ambulance Room.

The provision of an Ambulance Room is required under the Orders where 500 or more persons are employed. The accommodation, site, general construction, equipment and the provision for transport to hospital will depend upon the number of persons it is required to serve.

The Ambulance Room must be a separate room used only for the purpose of treatment and rest, with a floor space of not less than 100 square feet, smooth, hard and impervious walls and floor, and with ample means of natural and artificial lighting. It must contain at least—a glazed sink with hot and cold water always available; a table with a smooth top; means for sterilising instruments; a supply of suitable dressings, bandages and splints; a couch, and a stretcher.

A very complete illustrated brochure on the whole subject, from which the above abridged extracts have been taken, should be obtained by all to whom Section 7 (1) of the Police, Factories, &c. (Miscellaneous Provisions) Act applies. It can be obtained from His Majesty's Stationery Office or from St. John Ambulance Association, price 6d. net; by post, 7½d.

INDEX.

	Page
Abdomen	43, 48, 121, 153
,, wound in front wall of	124
Accident case, preparation for	16, 212
Acid, corrosive	127, 130, 147, 159, 170, 173, 174, 175
Aconite, poisoning by	172
Air	19, 139, 142, 147, 156
,, hunger	121
Alcohol, as a stimulant	20, 132, 177
,, as a poison	161, 171, 176
,, in insensibility	158
Alkali, corrosive	127, 130, 147, 159, 170, 173, 174, 175
Ambulance, to load and unload	209, 210
Ammonia, burn by	127
Anatomy	36
Ankle	43, 45, 46
,, sprained	84
Anterior tibial artery	110
Aorta	88, 98
Apoplexy	157, 163
Arm, bone of	41, 53
,, fracture of	68
,, ,, ,, involving elbow-joint	69
Arm slings	25, 26, 29, 57, 59
Arterial hæmorrhage	92, 93, 98
Arteries	86
,, main	98–112
Artificial Respiration	143, 224
Asphyxia	142, 147, 170
Atlas	38
Auricles	86
Axillary artery	104
Axis	38
Back, bandage for	33
Back-bone	38
Bandage, broad	23, 58
,, improvised	24
,, loop	58
,, many-tailed	222
,, narrow	23, 58
,, roller	214
,, triangular	23
Bandages, application of triangular	29–34
Belladonna, poisoning	171
Berries, poisoning by	157, 168, 171
Bites of rabid animals	131
,, snake	131, 170
Bladder	50

	Page
Bladder, injuries to	72, 123
Blisters	127, 128
Blood	50, 86, 88, 92
Brachial artery	105
,, ,, flexion	106
Brain	47, 152
,, compression of	157, 160
,, concussion of	157, 160
,, injury to	60
Breast-bone	40, 41, 48
,, ,, fracture of	66
Bronchial tubes	139
Brooch-bone	43
Bruises	117
"Brush burn"	127
Burns	127
,, by electric shock	151
Capillaries	86, 88
Capillary hæmorrhage	92, 112
Capsule	45
Carbolic acid, poisoning by	174
Carotid artery	99
Carpus, *see Hand.*	
Carrying, methods of	180
Cartilage	40, 45, 47
Cerebro-spinal system	50, 152
Cervical vertebræ	38
Cheek, bleeding from	100
,, bandage for	29
Chest	40, 48, 140
Chest, bandage for	33
Chloroform, poisoning by	171
Choking	147, 149
Circulation of the blood	86
,, to induce	145
Clavicle, *see Collar-bone.*	
Clothing on fire	129
,, removal of	19, 127, 128
Coccyx	38, 43
Collapse	157, 161
Collar-bone	41
,, ,, fracture of	66
Coma	155, 171
Comminuted fracture.	54
Complicated ,,	54
Compound ,,	54
Compression of the brain	157, 160
Concussion of the brain	157, 160
Connective tissue	48
Constriction	113, 132, 133
Contamination (*see also Germs* and *Sepsis*)	93
Contused wounds	91
Convulsions	157, 160, 171, 174, 176, 177
,, definition of	165
,, infantile	157, 167
Corrosives	127, 130, 147, 159, 170, 173, 174
Cranium, *see Skull.*	
,, fracture of	59

	Page
Crepitus	55
Crushed hand	71
„ foot	77
Cyanide of potassium, poisoning by ..	176
Deformity .. 12, 55,	82
Delirium .. 171,	174
Diagnosis .. 11,	12
Diaphragm .. 48, 86,	142
Digital pressure ..	94
Direct violence 53, 59, 61, 64,	74
Dislocation .. 46, 76,	82
Ditch, to cross with stretcher	207
Dorsal artery	112
Dressing 96, 114, 125,	128
Drowning .. 147,	148
Ear channel, hæmorrhage from 60,	117
„ passage, foreign body in ..	136
Elbow	41
„ bandage for .	34
Elbow-joint	46
„ „ fracture involving, *see Arm.*	
Electric shock 147,	150
Emetic 172, 174,	176
Epiglottis	139
Epilepsy .. 157,	165
Examination of an unconscious patient ..	158
Expiration	140
Extension .. 46,	57
External carotid artery	99
Eye, bandage for ..	29
„ foreign body in ..	134
Face, bones of ..	37
Facial artery 99,	100
Fainting .. 157,	161
Femoral artery ..	108
Femur, *see Thigh.*	
Fibula, *see Leg.*	
Finger-bones ..	41
Fingers, fracture of, *see Crushed hand.*	
„ hæmorrhage from	108
First Aid, meaning of	11
„ „ principles of	18
First Aider, qualifications of	16
Fish-hook in skin ..	134
Flexion of brachial artery	106
Food, poisoning by ..	171
Foot	45
„ bandage for ..	32
„ crushed ..	77
Fore and aft method of carrying ..	183
Forearm	41
„ fracture of ..	70
Forehead, bandage for	29

	Page
Forehead, hæmorrhage from	102, 103
Foreign body in ear	136
,, ,, in eye ..	134
,, ,, in nose..	137
,, ,, in throat	147, 149
,, ,, in wound	95
Four-handed seat ..	188
Fracture, causes of .	53
,, definition of	53
,, general rules for treatment of..	56
,, signs and symptoms of	55
,, varieties of.	53
Fractures, special	59–78
Frost bite	133
Functions of the body	36
Fungi, poisoning by	157, 168, 171
Germs (*see also Contamination* and *Sepsis*)	54, 92, 93
Glands..	48
Green-stick fracture..	54
Gristle (*see also Cartilage*)	40
Groin	108, 125
Gums, hæmorrhage from	115
Gun-shot wounds ..	91
Hæmorrhage and wounds	91
,, arterial	92,93,98
,, capillary	92, 112
,, from an internal organ	64,121-125,163
,, venous	92,113
Hand	41
,, bandage for ..	32
,, crushed ..	71
,, seats	180
Hanging ..	147, 149
Haunch-bone ..	43
Head, bandage for ..	29
,, bones of ..	37
,, hæmorrhage from..	102, 103
,, injuries to	59,157,160
Heart ..	40, 48, 86
Heatstroke ..	157, 164
Heel-bone	45
Hernia, *see Rupture.*	
Hip, bandage for ..	31
Hip-joints	43
History, meaning of..	12
Human stretcher ..	183
Humerus, *see Arm.*	
Hydrophobia ..	131
Hysteria ..	157, 166
Iliacs	99
Impacted fracture ..	54
Improvising bandages.	24
,, slings ..	29

	Page
Improvising splints ..	57
,, stretcher .	206
,, tourniquet	94
Incised wounds ..	91
Indirect pressure ..	94
,, violence	53,59,61,64
Infantile convulsions	157, 167
Insensibility	59,121,139,155
,, examination of a patient during.	158
,, varieties of ..	157
Inspiration	140
Instep	45
Internal carotid artery	99
,, organ, hæmorrhage from	64,121–125,163
,, ,, injuries to	64, 72, 121, 125
Intestines	50
,, injuries to	123
,, protrusion of, through wound in abdomen .	124
Involuntary muscles	47
Iodine, poisoning by..	175
Irritant poisons	170,173,175
Jaw	37
,, lower, fracture of	60
Joints	45, 46
,, injuries to ..	82
Jugular vein	100
Kidneys	50
,, injuries to ..	123
Knee, bandage for ..	34
Knee-cap	43
,, fracture of	53, 74
Knee-joint ..	43, 47
Knot, granny ..	23
,, loop	58
,, reef	23
Lacerated wounds ..	91
Leg, bones of ..	43
,, fracture of ..	76
Lifting into bed ..	210
Ligaments ..	40, 45
Lightning, effects of	127, 147
Limbs, bandage for .	58
,, lower ..	43
,, ,, if fractured	58
,, upper.. ..	41
,, ,, if fractured	57
Lingual artery ..	99
Lips, bleeding from ..	100
Liver	40, 49
,, injuries to	64, 123
Loin	38, 50
Loop bandage ..	58
Lower jaw	37
,, ,, fracture of	60
,, limb	43
,, ,, fracture of	58
Lumbar vertebræ	38,48,153
Lungs	40, 48, 139

	Page
Lungs, hæmorrhage from	115
,, injuries to ..	64
Lysol, poisoning by ..	174
Many-tailed bandage .	222
Membrane ..	45, 140
Messages ..	15, 21
Metacarpus, *see Hand.*	
Metatarsus, *see Foot.*	
Middle line of body, *Frontispiece.*	
Mouth, hæmorrhage from	115
Muscles	47
,, injuries to ..	82
,, ruptured ..	84
Muscular action ..	53
,, walls ..	49
Narcotics	147, 171, 174, 175
Needle, embedded ..	134
Neck, hæmorrhage from	99
Nerves	47, 50, 62, 153
Nervous system	152, 171
Nose	139
,, foreign body in ..	137
,, hæmorrhage from	116
Objects of treatment of fracture ..	56
Objects of treatment of wounds ..	92
Occipital artery	99, 102
Opium, poisoning by	171, 175
Pad, ring	103
Palate	37
Palm	41
,, hæmorrhage from	107
Palmar arches ..	106
Pancreas	50
,, injuries to .	123
Patella, *see Knee-cap.*	
Pelvis	43
,, fracture of ..	72
Perchloride of Mercury, poisoning by ..	175
Phalanges, *see Foot or Hand.*	
Phosphorus poisoning.	174
Physiology	36
Plantar arch	112
,, arteries ..	110
Plants, stings of ..	131
Pleura	140
Poisoned weapons, wounds by ..	131
Poisons	19, 147, 161, 170, 171
Popliteal artery ..	108
Posterior tibial artery	110
Pressure, direct and indirect .	94
,, points	94, 98
Principles of First Aid	18
Prussic acid, poisoning by	157, 168, 172, 176
Ptomaine poisoning ..	171
Pubes	43
Pulmonary artery ..	90
Pulse	88, 97, 121, 158, 171

	Page
Punctured wounds ..	91
Pupils of eyes 155, 157, 159, 161, 171, 176	
Qualifications of a First Aider.. ..	16
Quicklime, burn by ..	127
„ in eye ..	136
Rabid animals, bites of	131
Radial artery ..	106
Radius, *see Forearm.*	
Reef knot	23
Respiration .. 139,	140
„ to excite..	145
„ artificial 143,	224
Respiratory system ..	139
Rest	19
Ribs 40,	48
„ fracture of ..	64
Ring pad	103
Rump-bone (*see also Sacrum*)	38
Rupture (hernia) ..	125
Ruptured muscles ..	84
Sacrum .. 38,	43
St. John sling ..	26
„ „ tourniquet .	98
Scalds	127
Scalp, bandage for .	29
„ hæmorrhage from	102
Scapula, *see Shoulder-blade.*	
Seats, two, three and four-handed 180, 186,	188
Sepsis (*see also Contamination* and *Germs*) .. 93,	127
Shelter .. 15,	19
Shin-bone	43
Shock .. 157,	161
„ electric .. 147,	150
Shortening .. 55,	56
Shoulder, bandage for	30
Shoulder-blade ..	41
„ „ fracture of	68
„ -joint ..	46
Signs, meaning of ..	12
Simple fracture ..	53
Single helper, support by 179,	180
Skeleton	36
Skin 19, 48,	54
Skull	36
„ fracture of ..	59
Slings .. 25, 57,	59
„ improvised ..	29
Smothering	147
Snake bite .. 131,	170
Socket of tooth, hæmorrhage from ..	115
Spinal canal . 38,	153
„ cord 38, 62, 152,	164
Spine 38,	48
„ fracture of ..	61
Spleen .. 40,	49
„ injuries to 64,	123

	Page
Splint, angular	70
„ Thomas	226
Splints	56, 57
„ improvised	57
Sprain	76, 83
Sprained ankle	84
Sterile	93
Sternum, *see Breast-bone.*	
Stimulants	20
Stings	131
Stomach	40, 49
„ hæmorrhage from	115
„ injuries to	122
Strains	84, 85
Stramonium poisoning	171
Strangulation	147, 148
Stretcher, carriage of	207
„ exercise, No. I.	191
„ „ No. II.	201
„ „ No. III.	203
„ Furley	189
„ human	183
„ improvised	206
Structure of the body	36
Strychnine poisoning	157, 168, 172, 176
Stunning	160
Stupor	155, 171
Subclavian artery	103
Suffocation	149, 171, 176
Sunstroke	157, 164
Surroundings	14
Swelling of tissues of throat	147, 149, 173
Syllabus of instruction	2, 3
Sympathetic system	48, 50, 152, 153
Symptoms	12
Syncope, *see Fainting.*	
Synovial fluid	45
„ membrane	45
Systemic circulation	88
Tail-bone (*see also Coccyx*)	38
Tarsus, *see Foot.*	
Temperature of the body	48, 128, 161, 176
Temporal artery	99, 101
Tendons	47
Thigh-bone	43
„ „ fracture of	72
Thomas splint	226
Thoracic vertebræ	38
Thorax	48
Three-handed seat	186
Throat	139
„ foreign body in	147
„ hæmorrhage from	115
„ scald of	147
„ swelling of tissues of	147, 149, 173
Thumb	41
Tibia, *see Leg.*	
Tibial artery	110

	Page
Tissue	40, 45, 47, 53, 88, 153
„ connective	.. 48
„ of throat, swelling of	147, 149, 173
Tobacco, poisoning by	162
Toes, *see Foot.*	
Tongue	 140
„ hæmorrhage from	115
Tooth, socket of, hæmorrhage from	.. 115
Tourniquet, St. John.	98
„ to improvise	94
Transport	16, 19, 179
Triangular bandage	.. 23
Trunk	 48
„ bandage for	.. 58
Two-handed seat	.. 180
Ulna, *see Forearm.*	
Ulnar artery	. .. 106
Unconsciousness, *see Insensibility.*	
Upper limb, if fractured	57
„ limbs	 41
„ „ hæmorrhage from	103
Varicose veins	.. 114
Veins	.. .. 86, 88
„ varicose	.. 114
Venous hæmorrhage	.. 113
Ventricles	 86
Vertebra	.. 38, 62
Vertebral column	38, 153
Vertical wound of abdomen	 124
Violence, direct	53, 59, 51, 64, 74
„ indirect	53, 59, 61, 64
Vitriol, burn by	.. 127
„ in eye	.. 136
Voluntary muscles	.. 47
Wall, to cross with stretcher	 208
Warmth	.. 19, 20
Windpipe	.. 100, 139
Wound	 19
„ in front wall of abdomen	.. 124
Wounds and hæmorrhage	91
„ by poisoned weapons	.. 131
„ general rules for treatment of,	
„ accompanied by arterial hæmorrhage	 93
„ accompanied by capillary hæmorrhage	.. 112
„ accompanied by venous hæmorrhage	 113
„ object of treatment of	.. 92
„ varieties of	.. 91
Wrist	 41

ST. JOHN AMBULANCE ASSOCIATION.
Abridged Price List.

Important help towards the efficient rendering of First Aid is a complete and reliable Ambulance Equipment. It is said to be an actual necessity, which year by year is being progressively recognised officially throughout the British Empire.

With the growth of motor traffic in all parts of the United Kingdom, and the increased risk of accidents contingent thereto, public attention is constantly being drawn to the good resulting from the efficient rendering of First Aid to injured persons, given in all cases gratuitiously, by those serving under the Order of St. John; that to-day there is a greater readiness to assist those promoting and carrying out First Aid assistance to obtain the First Aid Equipment necessary.

The Stores Department of the St. John Ambulance Association, specialises in high quality First Aid Equipment of a thoroughly efficient and reliable nature, and at prices which will bear comparison. Information regarding the work of the Association and complete Illustrated Price List can be obtained upon application to the Head Office, St. John's Gate, Clerkenwell, London, E.C. 1.

Orders value 40s. or over, are sent carriage paid to any part of the United Kingdom. In cases where orders of less value are prepaid, it is requested that an amount sufficient to cover carriage or postage be added to the remittance; this will save possible delay in the despatch of the order. Any amount which may be sent in excess, will be returned at the time.

Orders and correspondence should be addressed to **the St. John Ambulance Association, St. John's Gate, Clerkenwell, London, E.C. 1.**

Remittances should be made payable to the St. John Ambulance Association, and crossed "Westminster Bank Ltd., Clerkenwell Branch."

Money Orders and Postal Orders may be made payable at the Clerkenwell Green Post Office.

LITTERS.

For hand-propelled wheeled transport, solid or pneumatic india-rubber tyres.

STRETCHERS.

"FURLEY" improved pattern.

Special Appliances for lifting injured persons in the vertical position.

"LOWMOOR JACKET" and "NEIL-ROBERTSON" STRETCHER.

FIRST AID OUTFITS.

Fulfilling the requirements of—

(*a*) FACTORY AND WORKSHOP ACTS.

"WELFARE."

Trades specially scheduled.

Docks Regulations, etc.

(*b*) WORKMEN'S COMPENSATION ACT, 1923.

Pit Banks of Metalliferous Mines. Building Regulations and other Home Office Orders.

(*c*) THE MERCHANT SHIPPING ACT (Steam Fishing Vessels).

Also for use in Coal Mines, Motor Coaches and Cars.

Roadside Outfits for Main Motor Roads, general use, etc., etc.

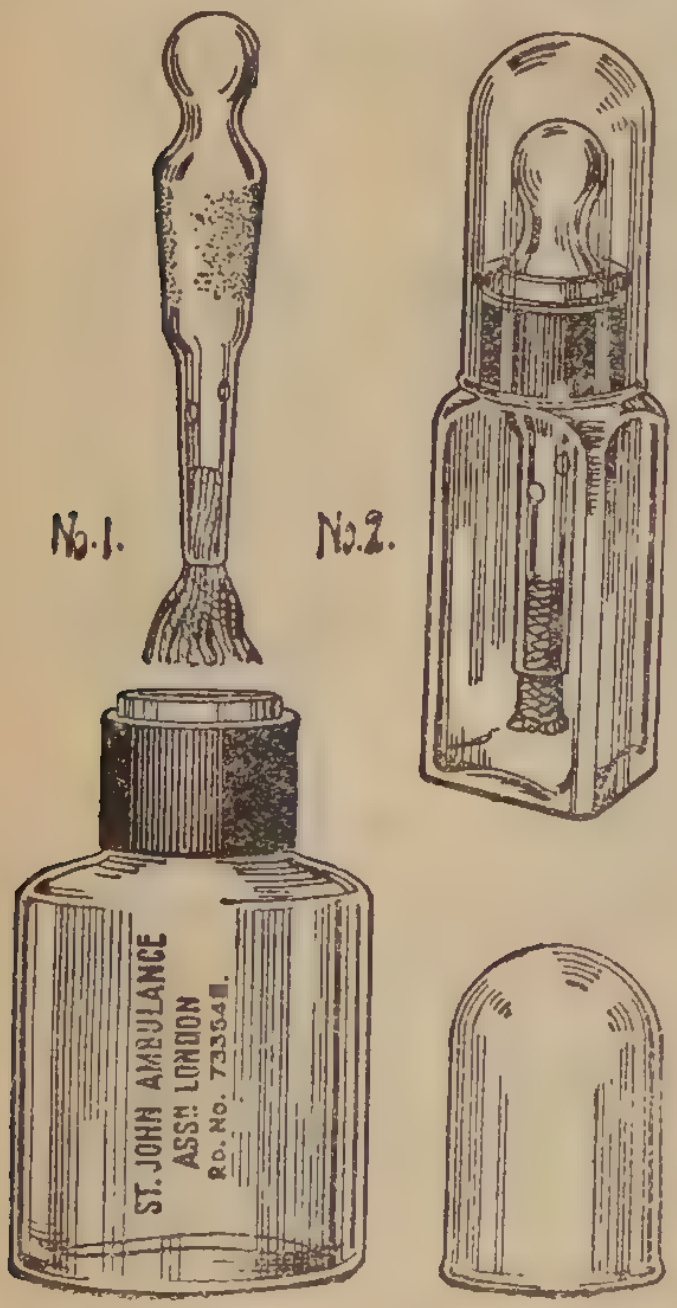
Price List on Application.

THE "ST. JOHN"
IODINE APPLICATION BOTTLE.

(Registered No. 733548.)

This invention meets a need experienced by First Aiders for a means of applying Iodine in either large or small quantities without waste, also for a bottle from which the escape of Iodine is reduced to a minimum or prevented entirely. An important feature is that the contents are only in contact with glass and the mop.

The mop can be changed instantly.



In two sizes:—

No. 1 (Large) for First Aid Outfits.
Size—$3\frac{7}{8}$ in. high, $1\frac{5}{8}$ in. diam.

No. 2 (Small) for the Pocket or Handbag.
Size—$3\frac{7}{8}$ in. high, 1 in. square, approx.

SPARE MOPS. "Brush" as No. 1 or "Stub" as No. 2 can be supplied with each bottle.

Full directions for use with each bottle.

Price List on Application.

BANDAGES.

Roller and Triangular.

SURGICAL DRESSINGS.

Lints, Cotton Wool and Gauzes, Plain and Medicated.

STERILISED DRESSINGS.

Fulfilling Home Office requirements.

ST. JOHN FIRST AID DRESSINGS.

Specially prepared for S.J.A. Brigade use.

ADHESIVE PLASTERS.

DRUGS.

Tincture of Iodine and Sal Volatile in Bottles and Ampoules.

INSTRUMENTS.

Scissors, Forceps, Spatulas, Clinical Thermometers, etc.

SPLINTS, ST. JOHN TOURNIQUET, SAFETY PINS.

BADGES for holders of the First Aid Certificate of the Association, and Uniforms of the St. John Ambulance Brigade.

PLEASE WRITE FOR PRICE LIST.

S.J.A.B.

AND

UNIFORMS

UNIFORM EQUIPMENT

BOY CADET.

Complete in Every Detail

Price Lists and Patterns on application.

GIRL CADET.

GARROULD

OFFICIAL OUTFITTERS

TO THE

ST. JOHN AMBULANCE BRIGADE

ILLUSTRATED PRICE LIST

OF

REGULATION UNIFORMS

FOR

LADY OFFICERS

AND

AMBULANCE SISTERS

Sent Post Free.

E. & R. GARROULD,

150 to 162, Edgware Road,

London, W. 2.

GARROULD

TO THE CROWN AGENTS FOR THE COLONIES
AND THE LONDON HOSPITALS, ETC.

NURSING DIVISIONS

OF THE

ST. JOHN AMBULANCE BRIGADE

FITTED OUT AT THE SHORTEST NOTICE.

Indoor and Outdoor Uniform Supplied. Illustrated Price List, Patterns and Self-Measurement Forms post free.

Carriage Paid on all orders of 10/- *or over in the United Kingdom.*

E. & R. GARROULD,
Edgware Road, W.2.

White lint absorbs blood
and does not draw.
Pink lint for Hot Lotions

Please - Pair

let - Press of Power

sexpence - Swelling

Disp - Deformity

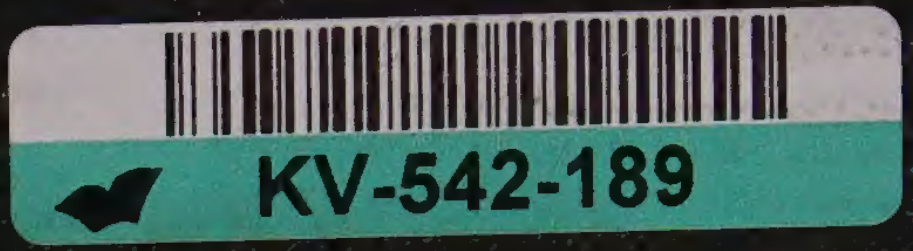
In - Irregularly

Uncles - Unnatural Mo

Cap - Crepetus

Cold tea Good for small burns.

Castor oil = Linseed Oil and lime water equal parts.


KV-542-189